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MANUAL INTERROGATOR

MODEL 1077

Instruction Manual
August 1983

P/N 1000-0658-801

MANUAL INTERROGATOR

MODEL 1077

August 1983

This manual has been prepared in three sections to provide a description and operating instructions for the Model 1077 Manual Interrogator. A list of terms and abbreviations commonly used is provided prior to the Table of Contents to assist in understanding the terminology used in this manual.

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TERMS AND ABBREVIATIONS COMMONLY USED IN THIS MANUAL

ANI:	Automatic Number Identification
ASCII CODE:	American Standard Code for Information Interchange, an 8-bit code
BANANA PLUG TERMINAL:	A single conductor plug having a banana-shaped spring metal tip
DIAGNOSTIC DUMP:	Transfer of diagnostic information contained in the memory of an APC ROTL system to the printer
DP:	Dial pulse
DTMF:	Dual-tone multifrequency
EML:	Expected Measured Loss
ERL:	Echo Return Loss
FAR-END:	Terminating office for the trunk under test (TUT)
FETL:	Far-end Test Line
FSK:	Frequency Shift Keying
KP:	Multifrequency signal which means prepare for digits
MF:	Multifrequency
NEAR-END:	Office where a ROTL is located and from where testing takes place to a distant office
OUTPULSING:	To dial
PARAMETER:	A set of physical properties whose values determine the characteristics or behavior of something
PATCH CORD:	Flexible electric cord having 1-6 conductors terminated on each end by a plug; used for making temporary connections between circuits terminated on jacks
RESPONDER:	Equipment at the far-end and/or near-end which responds to the test requests from a controller or RTS
RING:	Audible signal by a bell, second wire in a pair
ROTL:	Remote Office Test Line; the unit which receives commands from the controller or RTS and seizes outgoing trunks to be tested; all have a built-in responder and 105 test line
TRS JACK:	Tip/ring/sleeve jack

SELF-CHECK: Automatic tests conducted by a circuit upon itself to determine if it is operating correctly; responders self-check upon command from a controller or RTS

SERIAL COMMUNICATIONS PORT: A receptacle on the RTS which accepts a standard EIA RS-232-C plug

SIMPLEX: A signaling path over a dry talking circuit which uses the two sides of the circuit in parallel; derived by connecting the midpoints of repeating coils or retardation coils which are across the circuit

ST: Final multi-frequency signal which means the end of pulsing

TERMINAL BALANCE: Names used to mean Terminal (or termination) Balance and Long-Term; refers to the manual test used to conduct one-way loss/noise and balance (return loss) measurements

TEST LINE: A test termination or circuit capable of applying signaling and transmission tests and recognizing and replying to specific signals received

TIP: A ball-shaped contact at the end of a telephone plug; first wire in a pair of wires

TLP: Transmission level reference point

TPT: Test Progress Tone, 2225 Hz used as an identifying tone to indicate to the ROTL and control the time sequence in the accessing of the trunk, etc.

TRS: Tip/ring/sleeve

TUT: Trunk Under Test; the trunk between the near-end and the far-end which is selected and seized for testing

MODEL 1077 MANUAL INTERROGATOR

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MANUAL INTERROGATOR

MODEL 1077

DESCRIPTION

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1. INTRODUCTION

1.01 This manual is written for the craftsperson who has a basic understanding of the commonly used terms in telephone transmission switching, and more specifically, of automatic trunk testing systems.

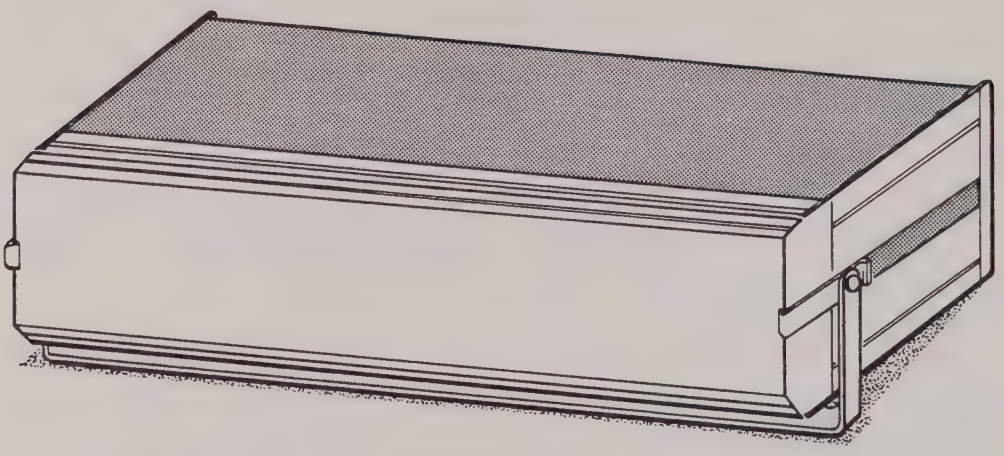
1.02 This section introduces the APC Manual Interrogator (Fig. 1-1), describes it, points out its operating features, and explains its capabilities.

1.03 The Model 1077 Manual Interrogator is portable and is used in conjunction with a far-end test line to perform one and two-way transmission tests on a trunk circuit. A 56A-type responder is an integral part of the Manual Interrogator. When testing into a far-end 105 test line, two-way loss, noise, noise with tone, and gain/slope may be performed. A far-end Code 100 test line allows one-way testing of loss and noise (see Fig. 1-3).

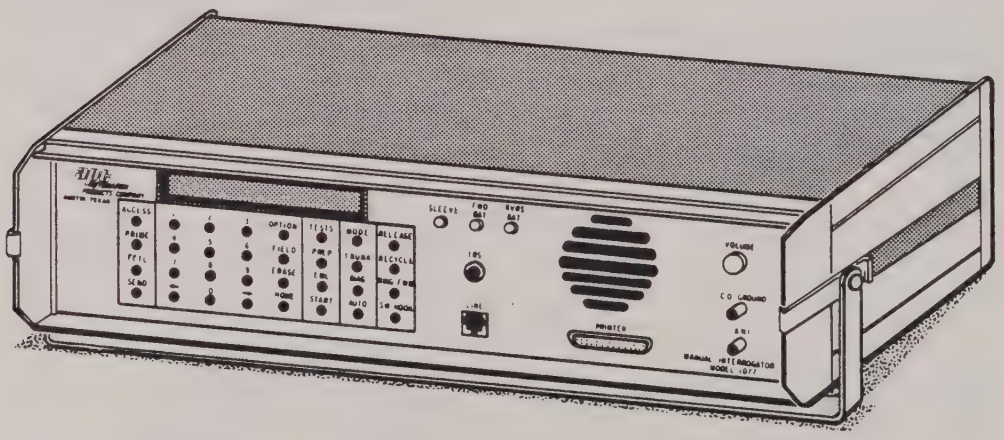
1.04 As a near-end type responder, the Manual Interrogator interfaces to two-wire, 900 ohm trunk circuits using a patch cord with a mating 310 plug on one end and the required connector on the other end. Trunk supervision is controlled manually with the switch hook control providing sleeve ground and loop hold coil. Indicators display the status of sleeve, forward battery, and reverse battery to aid the operator in satisfying trunk supervision requirements. Supervision is loop or simplex; outpulsing is dial pulse or MF (see Fig. 1-3).

1.05 The Manual Interrogator may also be used to control a ROTL to perform trunk tests from a remote location (ROTL Test Set). In this mode, connection to a subscriber line is through a modular phone jack. Outpulsing is dial pulse or DTMF (see Fig. 1-2).

Front View With Panel



Front View Without Panel



Rear View

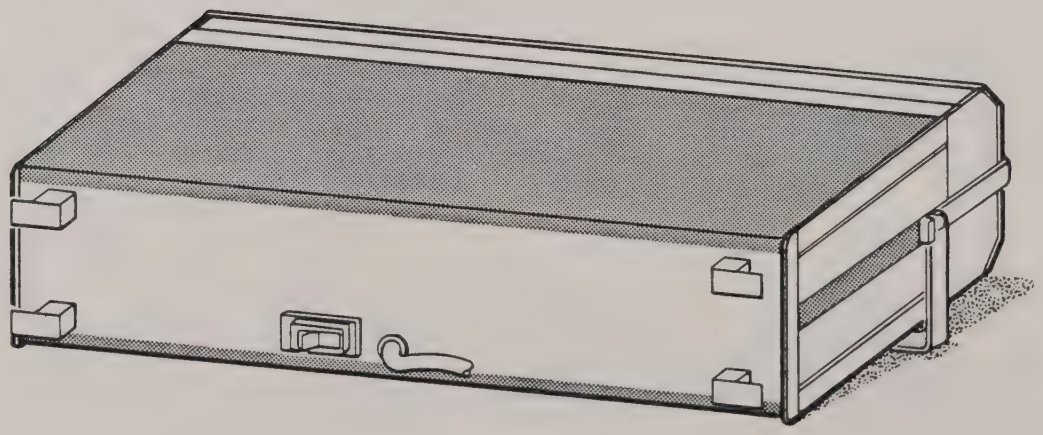


Fig. 1-1 Model 1077 Manual Interrogator

1.06 The responder circuit may be used as a far-end when connected to a subscriber line. It may be ringing or sleeve ground activated.

1.07 A 1004 Hz, 0 dBm milliwatt source is available. It may be activated manually (switch hook) or automatically (ringing or sleeve ground).

1.08 The operator controls the indicators on the Manual Interrogator allowing easy entry of required parameters, control of the testing sequence, and display of results. The minimum required entry for two-way testing is the far-end test line number. A 20-character display shows the numbers entered and displays the results of all tests. Pushbutton keys allow the control of the testing.

1.09 An RS232-type serial output port allows automatic logging of measurement results when attached to the user's printing device. Optional two-way communications through this port will allow remote automatic control of the Manual Interrogator features.

1.10 Automatic operating features include detection of far-end test line type by the answer tone and performance of all appropriate one or two-way tests without operator intervention.

2. GENERAL DESCRIPTION

A. Physical Description

2.01 The physical dimensions of the Manual Interrogator are 13 1/2" x 18" x 5 1/4". Its approximate weight is 20 lbs.

2.02 An integral AC power cord and circuit breaker are located at the rear of the unit.

2.03 External power required is 115 VAC, 50 watts.

2.04 The operating environment is 0 to 50 degrees C (32 to 122 degrees F.), 10 to 90% relative humidity (noncondensing).

B. External Connections

2.05 A tip/ring/sleeve jack that accepts a 310 plug is provided for a patch cord to access the trunk circuit.

2.06 A modular telephone jack is provided to attach a subscriber line for remote access to a ROTL. This jack is wired parallel to the TRS jack so that patch cord access to a ROTL is also possible.

2.07 A banana plug terminal is provided for reference to Central Office ground for trunk seizure (CO Ground Connection, Front Panel).

2.08 Another banana plug is provided for the Automatic Number Identification lead (ANI).

2.09 A 25 pin female D-subminiature connector is provided for connection to the user's printing device (RS232).

3. OPERATING FEATURES

A. Display Panel

3.01 The display panel contains the following features, shown in Fig. 1-4:

(a) 20 Character Alphnumeric Display: A 14 segment vacuum fluorescent display which shows the results of the keyboard entries and test measurements.

(b) Internal Speaker: An integral speaker circuit that monitors and amplifies all tones transmitted by the Manual Interrogator and received from the ROTL system.

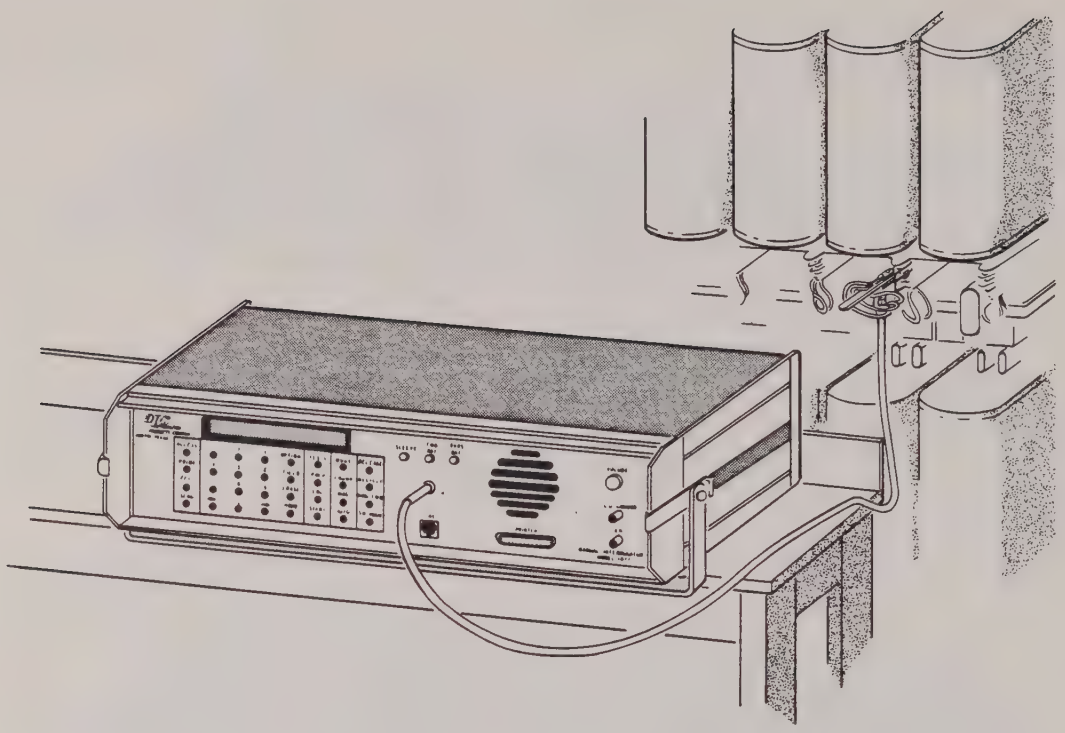


Fig. 1-2 Manual Interrogator Connection, Step-by-Step Office

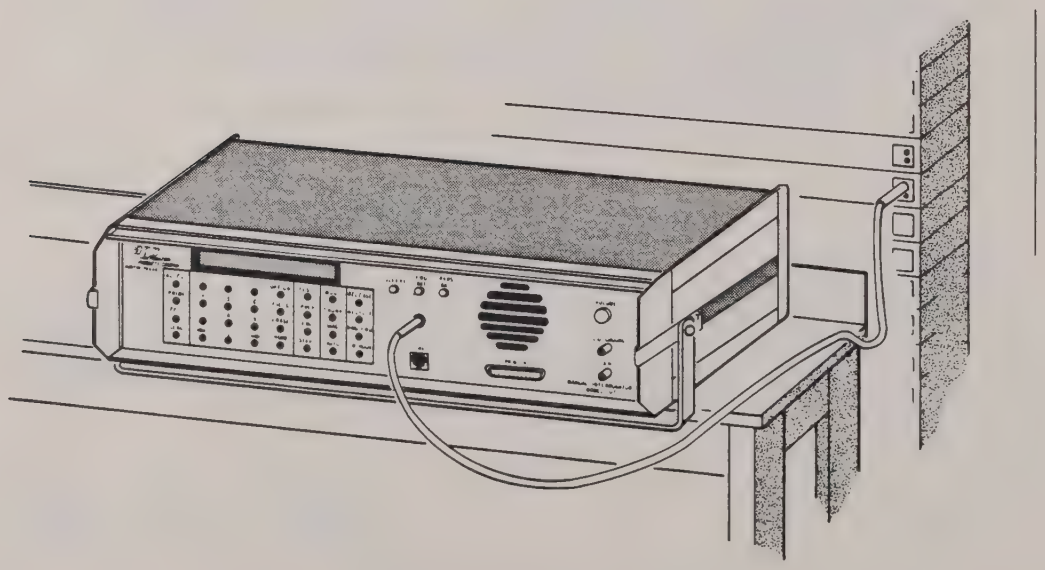


Fig. 1-3 Manual Interrogator Connection, Trunk Circuit (Stromberg-Carlson XY Office)

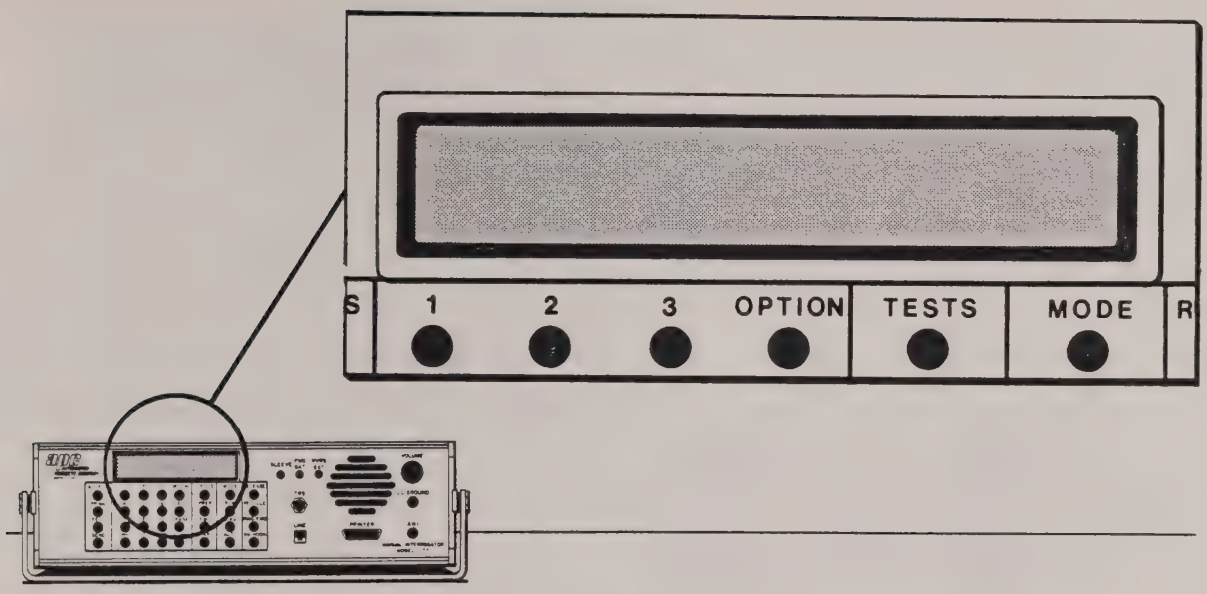


Fig. 1-4 Display Panel

(c) On/Off Control: A power control switch which is illuminated when the Manual Interrogator is on and connected to external power. The switch is located at the rear of the Manual Interrogator.

B. Control Panel

3.02 Fig. 1-5 depicts the operator's control panel. The pushbuttons and switches, in conjunction with the 20 character display, are used to control the near-end responder, the ROTL Test Set function of the Manual Interrogator, and to display test results.

3.03 Outpulsing may be MF, dial pulse, or DTMF. Three 30 digit fields are provided: one for ROTL priming, one for ROTL access number, and one for far-end test line number. The full thirty digits are stored internally and are available for recall at any time. The numeric keyboard and cursor control keys are used to enter and edit the displayed field. KP and ST are inserted automatically for MF outpulsing. The entire displayed field is outpulsed automatically when the SEND key is activated.

3.04 The TESTS select button allows the selection of the desired transmission tests to be run. It also allows selection of measurements, self-checks, or both.

3.05 The PREP button allows entry of the 100, 102, 105, 600/900, and 0/-2 dB parameters for the prep digit when operating through a ROTL. It also selects the far-end test line type when functioning as a near-end.

3.06 The EML button allows entry of optional limits for test results. This causes the selected test to be run continuously and provides audible feedback to a craftsperson performing adjustments on the trunk circuit.

3.07 The START test pushbutton activates the transmission tests when the far-end responder is connected. Depressing the button causes the

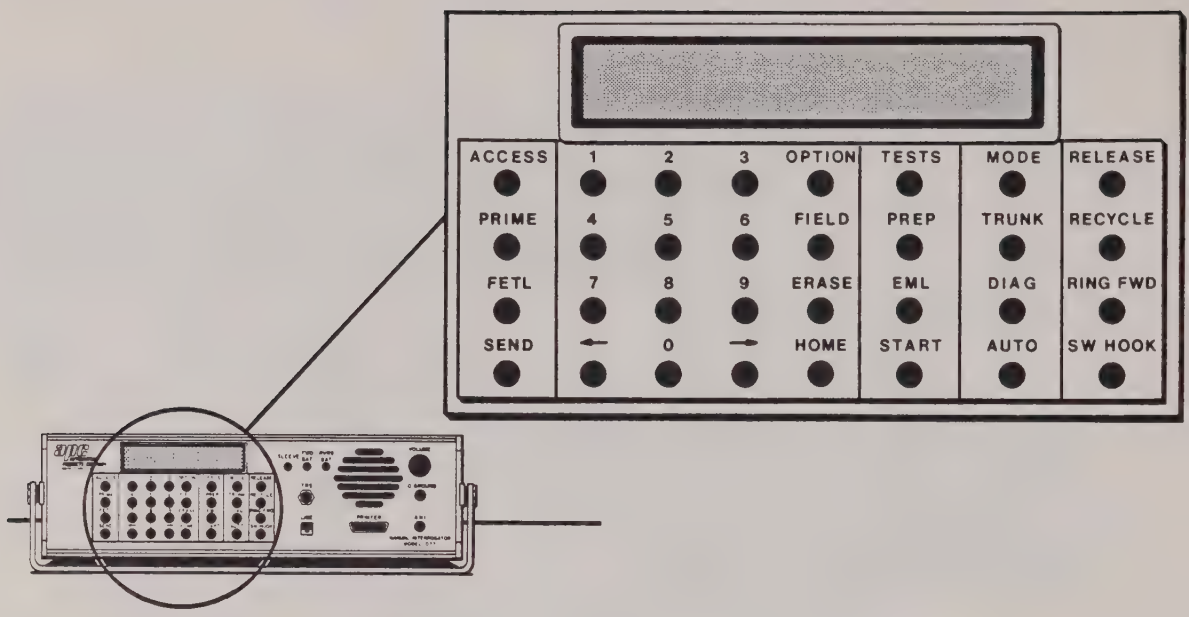


Fig. 1-5 Control Panel

MF command for a particular test to be transmitted to both responders and the results to be displayed. When testing with a ROTL, the prep digit is automatically inserted.

3.08 The MODE button selects operation as a near-end responder, far-end responder, ROTL Test Set, or milliwatt source.

3.09 The DIAG button activates extensive self-checks of the Manual Interrogator circuitry.

3.10 The AUTO button activates the automatic operating mode. When in automatic, the Manual Interrogator sequences all steps and performs all transmission tests appropriate for the particular far-end test line without operator intervention.

3.11 The RELEASE, RECYCLE, and RING FWD (ring forward) keys are used to control operation through a ROTL. The RELEASE key may also be used to release the far-end responder when the Manual Interrogator is used as a near-end of ROTL test set.

3.12 The SW HOOK (switch hook) control closes the sleeve to ground and closes the loop hold coil on the trunk.

C. Other Features

3.13 The SLEEVE, forward battery (FWD BAT), and reverse battery (RVRS BAT) indicators display the supervision of the trunk connected to a near-end responder (see Fig. 1-6).

3.14 As a far-end responder, operation is totally automatic and operator controls are not allowed.

3.15 The Manual Interrogator may be operated in one of four basic modes: Near-end Responder, Far-end Responder, ROTL Controller (RTS), or milliwatt. These modes are selected by the MODE key.

4. CAPABILITIES

A. Near-end Responder

4.01 As a near-end responder, the Manual Interrogator is capable of seizing a trunk or line circuit, outpulsing a far-end test line number, detecting a far-end answer tone, and conducting one and two-way transmission tests. The trunk may be loop or simplex or a line circuit (dial tone). Outpulsing may be MF, DTMF, or dial pulse. The far-end may be a 100 or 102 test line, a 105 test line/responder, or an LC 145/1070 test line.

4.02 The TRUNK key allows selection of the type of originating circuit attached to the Manual Interrogator. If no selection is entered, the default selection is a line circuit and dial tone. Loop or simplex trunks may be selected and a wink-start option may be entered for trunks. When a trunk is selected, no dial tone is required; forward battery condition is verified and the C-lead (sleeve) is checked for idle condition. The wink-start option causes the Manual Interrogator to wait for a wink (battery reversal) before outpulsing, when in the automatic mode.

4.03 The SW HOOK control initiates trunk/line seizure or release. For seizure, the sleeve is grounded if idle and a hold coil is connected across tip and ring. This enables the LED display for forward and reverse battery and sleeve lead. If a wink is required, it is detected at this time. Depressing the SW HOOK pushbutton again releases these connections.

4.04 The far-end test line number is entered into either the ACCESS or FETL fields, depending upon the trunk or line type. When on a line

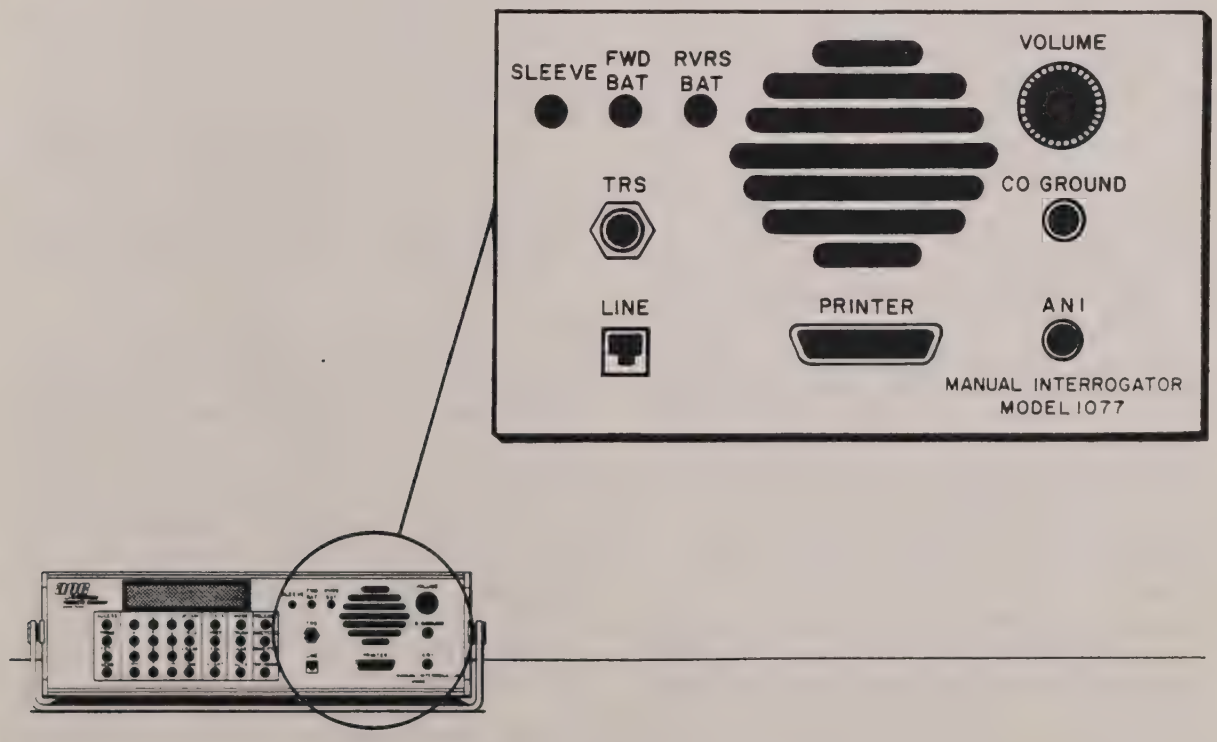


Fig. 1-6 Other Features

circuit, the ACCESS field is preferred. This allows DTMF or dial pulse signaling with optional pauses for second dial tone (PBX outgoing access). For a trunk circuit, the FETL field is preferred, allowing MF or dial pulsing signaling. For MF, the KP and ST are inserted automatically. The test line number is entered into the correct field using the numeric keyboard and can be recalled at any time. The entire field is outpulsed with the SEND key.

4.05 The far-end test lines will respond with a tone signal (may also be the test tone). The 105 responder answers with TPT (2225 Hz) and all others with 1004 Hz test tones. The Manual Interrogator is capable of detecting either tone, and when in automatic will adjust the testing requirements appropriately.

4.06 When in the near-end mode, the prep digit is not transmitted but the test line type entered in the PREP field will modify the testing sequence. The test line may be 100, 102, or 105. The 105-type responder allows two-way measurements of loss and noise. It also allows optional gain/slope, noise with tone, and echo return loss. One-way loss is implemented for 100 and 102 test lines and, optionally, noise for 100 test line. (For 145 test, one-way loss at three frequencies and one-way noise are implemented).

4.07 The TESTS field allows the selection of the tests to be run, and for measurements on self-checks. One or two individual tests may be selected, or ALL may be entered to automatically select all tests appropriate for the test line type.

4.08 When the far-end is connected, testing may begin. The START key controls this feature. For manual operation, a test is conducted each time the key is operated. In the automatic mode, all tests selected are run in succession. The test results for both directions are displayed simultaneously.

4.09 When testing is complete, the RELEASE key may be used to send the release MF to the far-end responder. The SW HOOK key may now be used to drop the trunk/line connection.

4.10 The automatic mode is initiated with the AUTO key. This causes all the above steps to be sequenced automatically. The various selections must have been previously entered, but the actions required are performed without further intervention. If the sequence cannot be continued, it is halted and the display indicates the problem detected.

4.11 When connected, the user's RS232-compatible printer or terminal allows the automatic logging of test results. Data is logged "on the fly" with two sets of tests on each printed line. A blank line separates each new testing sequence.

B. Far-end Responder

4.12 The far-end mode allows the 1056A responder to be accessed as a far-end 105 test line/responder. This provides all the capabilities of the APC Model 1056A Mini-Responder. Activation may be automatic or manual.

4.13 The SW HOOK key initiates the manual activation. This causes the Manual Interrogator to go off-hook and connect the responder to tip and ring as a far-end. The 1056A is now awaiting MF commands. If none are received in 15 seconds, the 1056A begins its manual sequence of transmitting the three gain/slope tones for 10 seconds each and then connecting a balance termination. This mode is terminated by the SW HOOK key, receipt of a release MF, or a time-out.

4.14 The AUTO key initiates the automatic mode for the responder.

The Manual Interrogator is now ready for ringing or sleeve ground activation, and behaves as a 105 test line/ responder.

C. ROTL Controller

4.15 This mode allows the Manual Interrogator to control a ROTL for remote trunk testing.

4.16 The ROTL may be accessed distantly through a dial-up connection or locally with a patch cord to the ROTL frame. When the connection is dial-up, signaling may be DTMF or dial pulse. Line seizure and outpulsing are the same as the near-end mode.

4.17 The priming digits are sent as two of six multifrequency tones. The PRIME field contains all of the priming. The KP and ST are automatically inserted when the SEND key is depressed.

4.18 The prep digit is transmitted to the ROTL before each test command to set the test line type, impedance, and transmission level point (TLP). This varies from the near-end mode, where the prep digit is interpreted internally.

4.19 The TESTS selection and START functions operate identically to the near-end mode.

4.20 The RING FWD key sends .1 second 1300 Hz to control testing to a 103 test line. Operational tests, in general, require the operator to listen to timed sequences of TPT, corresponding to supervision changes, in order to judge the success of the test.

4.21 The RELEASE key operates as in the near-end mode. The RECYCLE key sends one second 1300 Hz to terminate the current test and begin a new one. When in the ROTL control mode, the two-second disconnect tone is automatically sent when the switch hook control is used to hang up.

4.22 The AUTO mode operates the same as near-end (see para. 4.10).

4.23 The PRINTER mode operates the same as near-end (see para. 4.11).

D. Milliwatt Source

4.24 This mode causes the Manual Interrogator to function as a 102 (milliwatt) test line. It may be activated automatically or manually.

4.25 The SW HOOK key causes the Manual Interrogator to go off-hook and transmit 1004 Hz 0 dBm to tip and ring until the SW HOOK key is depressed again.

4.26 The AUTO key activates the automatic mode of the milliwatt. This mode allows the Manual Interrogator to act as a 102 test line. Activation is ringing or sleeve ground start, and termination is calling party disconnect, or after a 30 second time out.

MANUAL INTERROGATOR

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OPERATION

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1. GENERAL

1.01 This section contains the detailed operating instructions for the APC Model 1077 Manual Interrogator (see Fig. 2-1). The operation of the control panel is explained, followed by step-by-step, typical operating sequence; several paragraphs on external signal connections; a short part on maintenance; and the priming format tables.

1.02 Before reading this section on operation, it is recommended that the reader refer to Part 3, Typical Operating Sequences (see contents above), and, with the Manual Interrogator, follow the steps as described. Performing a typical sequence first will help in understanding the operating instructions.

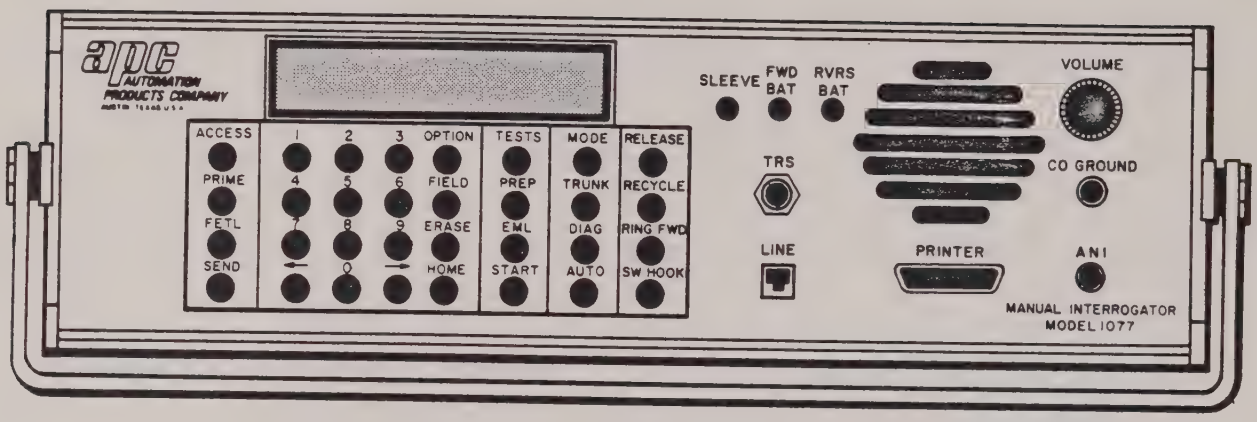

Fig. 2-1 Model 1077 Manual Interrogator

1.03 The operator controls the Manual Interrogator with the keyboard and the display (see Fig. 2-2).

1.04 The keyboard is divided into sections according to the type of key. There are four basic types of keys:

(a) Numeric Keys: used to enter a string of numbers (0-9)

(b) Edit Keys: used to affect some change in the display

(c) Display Keys: used to display parameters

(d) Function Keys: used to perform functions.

1.05 The four basic types of keys create several categories and include all of the keys on the Manual Interrogator as shown in Fig. 2-3.

1.06 The data shown in the display will correspond to the last function entered from the keyboard. Typical data includes the various operating mode selections, the access number and priming field numeric entries, and the results of the transmission test measurements. For each major keyboard function, the entire field will be displayed, but only one function will occupy the display at one time (see Fig. 2-4).

1.07 All operating parameters and numeric entry fields are stored in the internal memory and may be recalled for use or display at any time.

2. OPERATING INSTRUCTIONS

A. Numeric Entry

2.01 The centrally located numeric keys are used to enter the access, priming, and FETL number fields. The correct field is selected with either the ACCESS, PRIME, or FETL display keys. Depressing either key will recall to the display the last entry for that field and will enable the numeric entry or edit for that field.

2.02 Data is entered into the display using the numeric keys 0 through

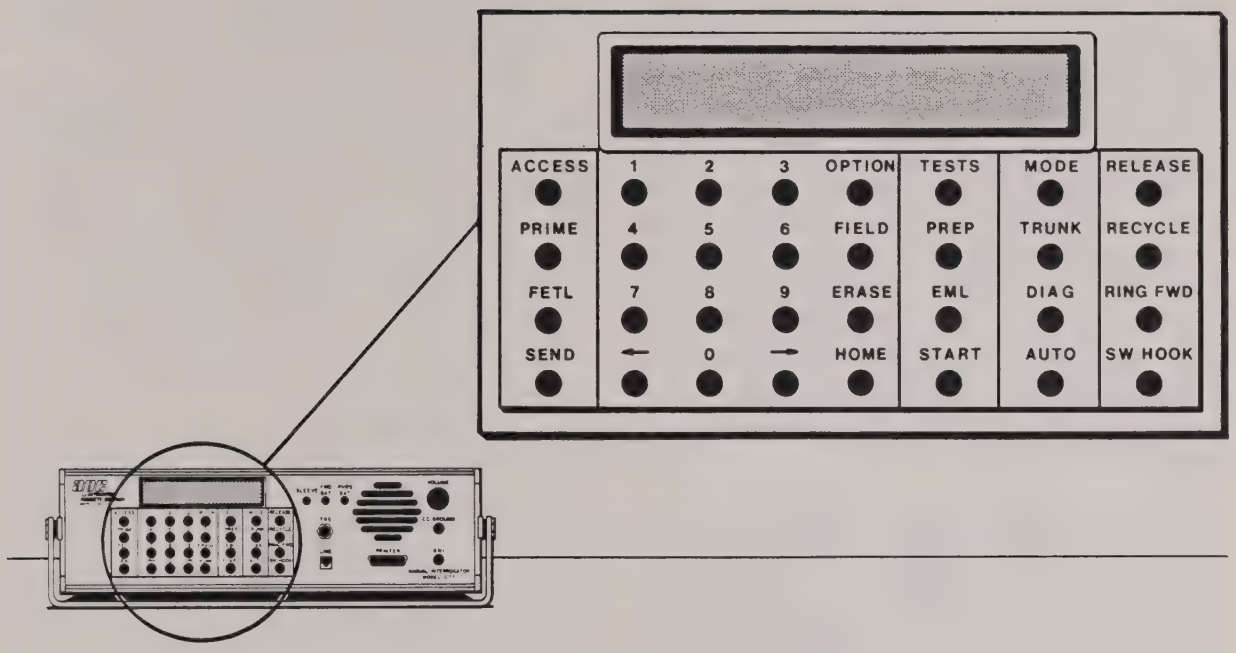

Fig. 2-2 Keyboard and Display

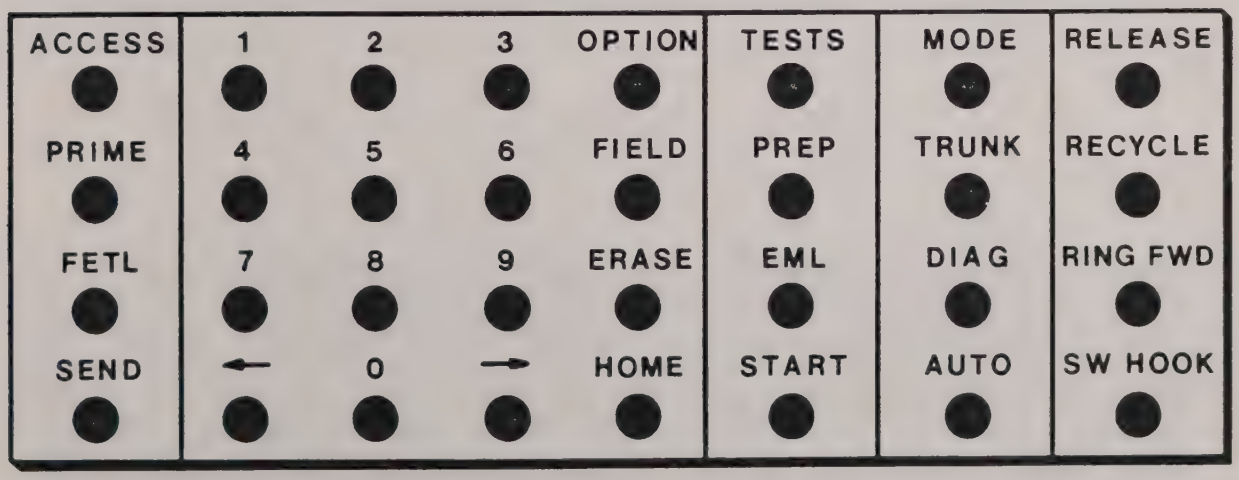

Fig. 2-3 Manual Interrogator Operator Keys

9 (KP and ST are included internally). Numbers are entered from left to right with each successive entry occupying the position one character to the right of the previous entry. When making the first entry into an empty field, the first keystroke will enter into the left-most character position and the rest of the display will be blank. Thereafter, a blinking cursor will appear in the position of the next character to be entered. When all characters have been entered, the field will be stored for use and later recall (see Fig. 2-5). The cursor will be disabled.

2.03 Blanks may be inserted into the numeric fields for readability or special functions. A blank may be significant or nonsignificant. A nonsignificant blank is simply a blank space left by moving the cursor past a position with no entry. This blank is for readability only and has no effect on the Manual Interrogator.

2.04 A significant blank is created by the OPTION key and is indicated by a carat ($\wedge$). This special blank causes one of two things: (1) when used in the access number, the Manual Interrogator pauses for a second dial tone, and (2) when used in the PRIME or FETL numbers, a pause equal to the length of one MF digit is inserted.

B. Edit Keys

2.05 Cursor control keys are arrows pointing one to the left ($<$), and one to the right ($>$). The cursor will be displayed at the character position last modified. To change the character under the cursor, the numeric keys are used to enter the new character. The entry replaces the

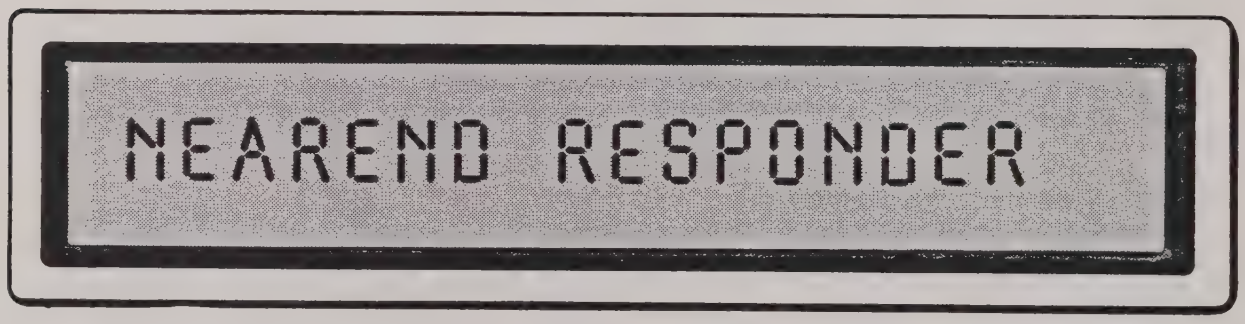

Fig. 2-4 Near-end Responder Display Reading

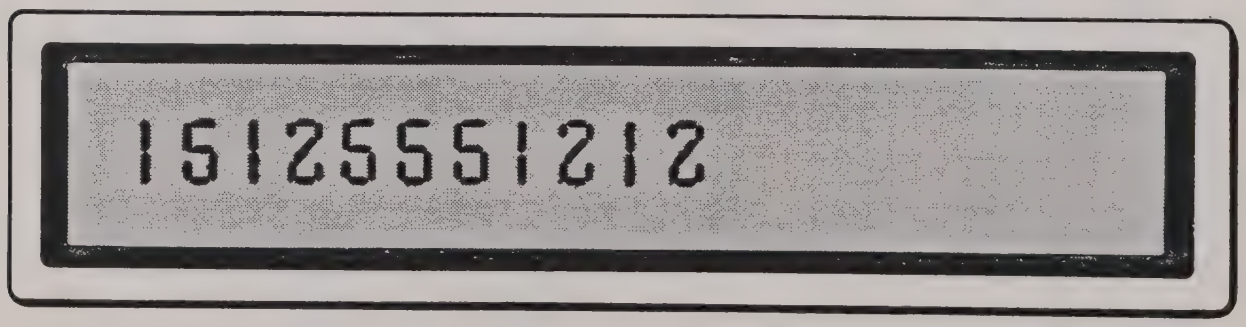

Fig. 2-5 Access Number Entry

previous character and the cursor moves one position to the right or left respectively, and will repeat if held depressed. The cursor may be moved to the right past a blank character to make the display more readable.

2.06 The HOME key moves the cursor to the left-most position of the display.

2.07 The ERASE key deletes all characters to the right of the cursor including the character under the cursor. Characters to the left of the cursor remain unchanged. The Sequence HOME, then ERASE, will blank the display.

2.08 The FIELD and OPTION keys are used to select various options from the menus displayed. Their operation depends on which menu occupies the display. Detailed operating instructions are included in the appropriate sections. In general, however, the FIELD key is used to move the cursor to the various fields in the display. The OPTION key steps through the various options available at the particular field.

C. Numeric Fields

Access

2.09 The ACCESS key recalls to the display the current access number for entry or edit. This number is typically used to dial over a line circuit and may contain up to 30 digits. Dialing may be dial pulse or DTMF.

2.10 The FIELD key is used to select the two dialing options. When depressed, the right end of the display will alternate between DP and TT. DP is dial pulse, TT is DTMF.

2.11 The OPTION key is used to insert pauses (significant blanks) and also to insert the * and # and column 4 special DTMF signals. When depressed, the carat (⋀) is shown in the display of the current cursor position. If the cursor is positioned under a pause (⋀), then depressing the OPTION key again will change it to a *. Depressing it a third time changes it to a #, a fourth time to /, and then to A, B, C, D, and then to blank (nonsignificant). Thus, the option key is used to enter pauses and special DTMFs. All other digits are entered with the numeric keys. Pauses and special DTMFs may be entered as often and in any position desired.

2.12 During the outpulsing, dialing pauses and dial tone is detected when a pause is reached. If dial tone is not expected but the pause is required, the SEND key will cause dialing to continue from the pause. A / causes the outpulsing mode to change in mid-stream (DP to TT) so that outgoing access from a PBX or Centrex can be executed in the most efficient manner.

Priming

2.13 The PRIME key recalls the current priming number for entry and edit. Priming is typically used when controlling a ROTL. Priming is always sent as MF. Up to 30 digits may be entered here.

2.14 The FIELD key has no effect on priming.

2.15 The OPTION key is used to insert significant blanks (⋀) to cause delays of one MF digit during outpulsing. This is used only when controlling a #5 Crossbar ROTL. When outpulsing, the KP digit is sent first and ST appended to the end automatically. These digits are not displayed.

FETL

2.16 The FETL key calls to the display the far-end test line num-

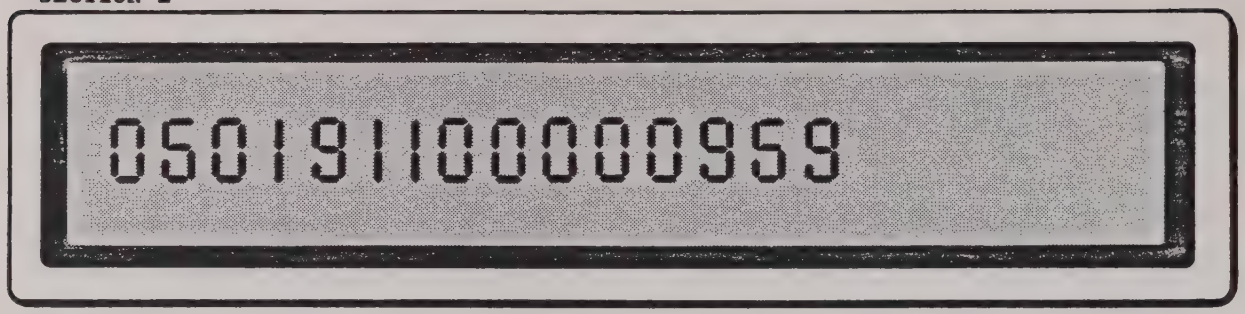

Fig. 2-6 Priming No. Less KP, ST

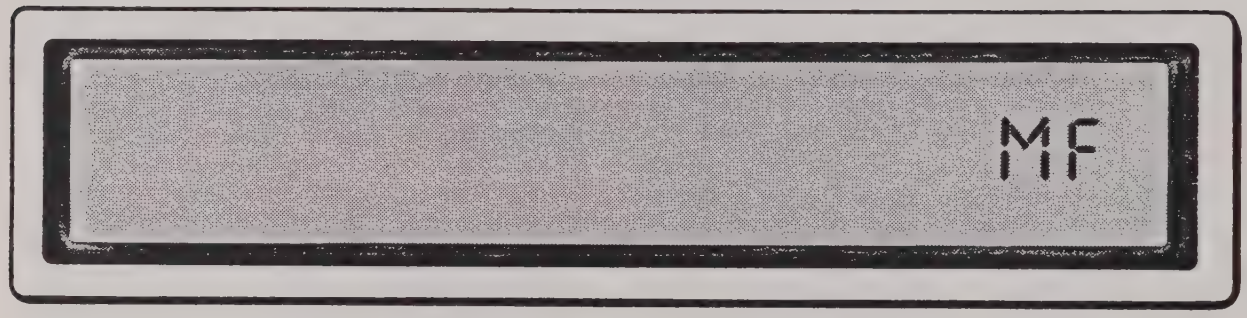

Fig. 2-7 MF or DP Signaling

ber for entry and edit. This field is typically used when outpulsing on a trunk. Up to 30 digits may be entered.

2.17 MF or dial pulse signaling is allowed and the selection is made with the FIELD key and is displayed in the right hand end of the display (MF or DP); see Fig. 2-7. Pauses (significant blanks) are not meaningful.

Send

2.18 The SEND key initiates outpulsing of the numeric field currently in the display. The field must be displayed to be outpulsed. Outpulsing is by the above numeric field descriptions. If AUTO sequencing is initiated, the SEND key is not used and outpulsing is automatic.

D. Test Fields

Tests

2.19 The TESTS menu allows selection of the transmission tests to be run. This menu has five fields and the FIELD key is used to position the cursor under the appropriate field for selection. The OPTION key changes the selections at that field.

2.20 The first four fields are for test selection and the fifth is for selection of measurements and self-checks. The OPTION key steps the display through LOSS, NOISE, N/TONE, GN/SLOPE, ERL, LC145 and ALL. If ALL is entered, the remaining fields are erased. However, the OPTION key still steps through the available selections. The fifth field may be OPTIONed between MEAS, SC or BOTH (see Fig. 2-9).

2.21 When testing begins, the tests are run in the order displayed for measurements and self-checks. When BOTH is entered, the self-checks immediately precede the measurements. When ALL is entered, all tests for the appropriate far-end are run. These are one-way loss and noise for 100, one-way loss for 102, two-way loss and noise, and, optionally, noise with tone and gain/slope for 105, and one-way gain/slope and noise for LC145.

2.22 The PREP menu allows the selections for impedance, transmission test level point (TLP), and far-end test line type. These three fields are manipulated with the FIELD and OPTION keys. The FIELD key steps through the three fields and the OPTION key steps through the options at each field. The first field selects 600/900 ohm impedance, the second field is 0/-2 dB (TLP), and the third is 100/102/105 test lines. The first two selections are meaningful only when the prep digit is to be sent to a ROTL because the Manual Interrogator has a fixed impedance (900) and TLP (0). The test line affects the testing both through a ROTL and as a near-end. When 100 or 102 is selected, tests are one-way only and the Manual Interrogator does not expect a second test result. LC145 requires that the test line type be 100. The 105 selection is for two-way tests to a responder and both results (far-to-near, near-to-far) will be displayed simultaneously when testing (see Fig. 2-10).

EML

2.23 The EML menu allows the entry of optional limits to be applied to test results. When the limits are in effect and automatic operation is initiated, the selected tests are repeated continuously and an audible feedback signal is generated to indicate within limits, or high or low.

2.24 The FIELD key is used to position the limit selection for each test. Tests are LOSS, NOISE,

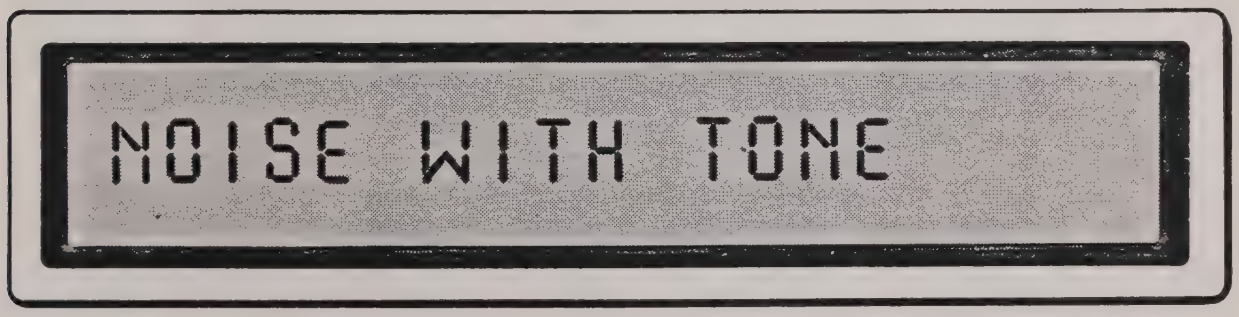

Fig. 2-8 Test Selection

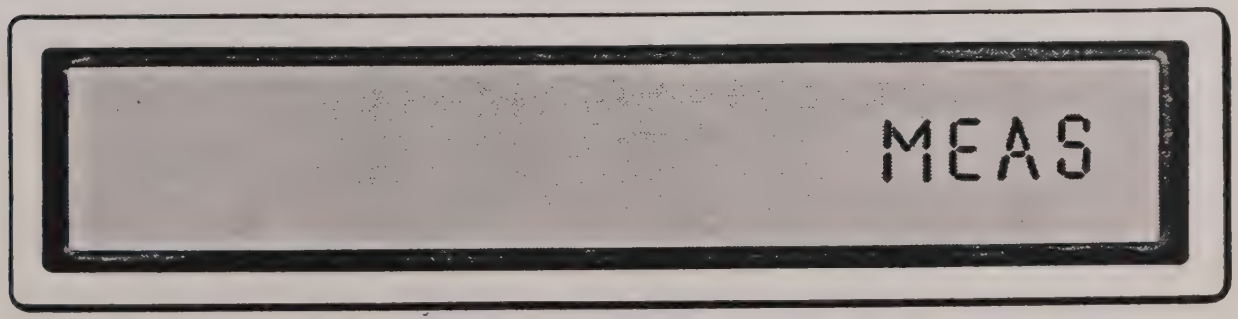

Fig. 2-9 Measurements or Self-checks

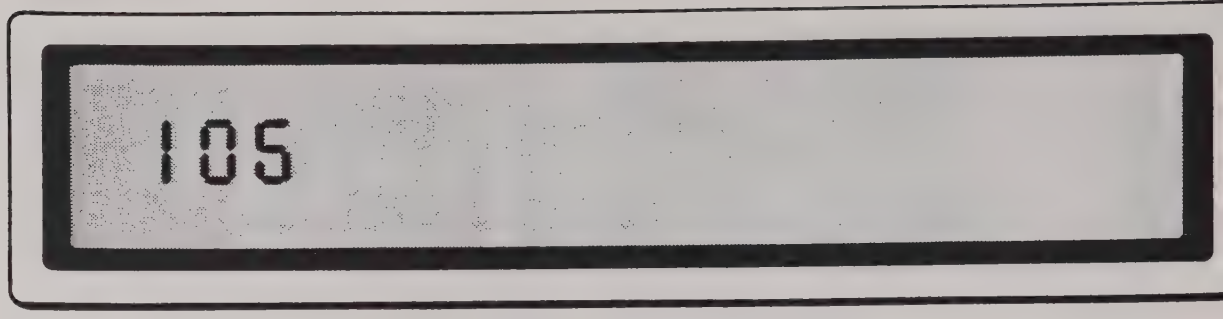

Fig. 2-10 105 Test Selection

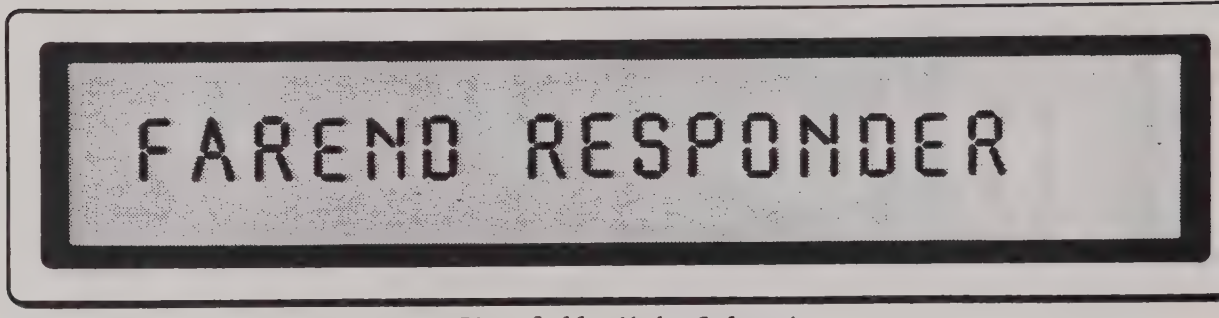

Fig. 2-11 Mode Selection

N/TONE, GS04, GS10, GS28, ERL, SRL, and SRLHI. The option key changes the sign (+ or -) of the selection. Note that loss type tests have negative results (i.e., -5.0 dB). The number keys allow entry of the specific value. Fractional digits are not allowed for noise type tests. The right and left arrows move among the four numbers for each test. The first pair of numbers represent the low and high limits of the far-to-near measurement. When these numbers are entered, they are duplicated into the second pair of numbers representing the near-to-far measurement. If a different set of limits is desired for near-to-far, the right arrow positions the cursor to the second pair of numbers and the limits can be entered.

2.25 The ERASE key resets all values to -99.0:+99.0 and disables the audio feedback.

2.26 During testing, two audio feedback tones are generated for each test to indicate whether measurements are within limits. The first tone indicates the far-to-near results and the second is near-to-far. There are four tones that represent the measurement status: 1000 Hz mean within limits, 1500 Hz means abov limits, 660 Hz means below limits, an 'bonk' tone means that the limits wer specified incorrectly.

Start

2.27 The START key initiates th transmission tests when the far end test line is attached. One com plete test is run each time START i depressed. Tests are run in the orde entered under the TEST menu. When al tests have been run, pushing STAR again restarts the sequence.

2.28 Test results for both direction are displayed concurrently wit the far-to-near result on the left an the near-to-far result on the right Results are of the form '-12.3' fo loss type tests (negative result indicating actual loss) and '23' fo noise type tests (no sign and n decimal point). MAX indicates that th result is above the range defined fo the test, MIN means under range, an ERR indicates any other error i decoding the resulting FSK signal.

2.29 If a printer is attached, th

results are printed automatically in addition to being displayed. If AUTO sequencing is initiated, the START key is not used but, rather, all tests are run automatically.

E. Mode Fields

Mode

2.30 The MODE menu selects the overall mode of operation of the Manual Interrogator. The OPTION key steps through the near-end, far-end, ROTL controller, and milliwatt. This selection drastically affects the Manual Interrogator's identity as described in SECTION 1, Capabilities. It is very important that the correct mode is selected (see Fig. 2-11).

Trunk

2.31 The TRUNK menu allows entry of the line of trunk type. The OPTION key steps through line, loop trunk, and simplex trunk. If TRUNK is selected, the FIELD key allows entry of wink (see Fig. 2-12).

2.32 The wink requirement is met during AUTO sequencing by delaying outpulsing until a wink is detected. A wink is defined as a battery reversal for a period of 100 ms to 350 ms. A reversal of over 350 ms is a glare condition on 2-wire wink start trunks.

Diagnostics

2.33 The DIAGNOSTIC key initiates the internal self testing feature of the Manual Interrogator. The set of automatic self tests that are executed at power-up is initiated; then the keyboard may be used to run additional diagnostics or to repeat a particular test.

2.34 There are 16 tests corresponding to the numeric keypad. Tests 0 through 9 are run automatically where the success of the test can be verified by the internal circuitry, and the remaining 6 tests corresponding to the edit keys must be manually initiated and the results determined by the operator.

2.35 The test results are run as follows:

0 - RAM
1 - RAM
2 - TIMER
3 - WIDE BAND DETECTOR
4 - TONE DETECTOR
5 - FSK DECODER
6 - RESPONDER SELF CHECKS
7 - FUTURE
8 - FUTURE
9 - FUTURE
<---- - DISPLAY
----> - KEYBOARD
FIELD - FSK SET
OPTION - FACTORY CALIBRATION
ERASE - BAUD RATE
HOME - FUTURE

Auto

2.36 The AUTO key initiates the automatic sequencing for the mode selected. If the sequence cannot be continued, it is halted and the display indicates the problem detected. The various modes and functions are described in SECTION 1, Capabilities (see Fig. 2-13).

F. Other Features

2.37 RELEASE sends the release MF command.

2.38 RECYCLE sends 1 second of 1300 Hz.

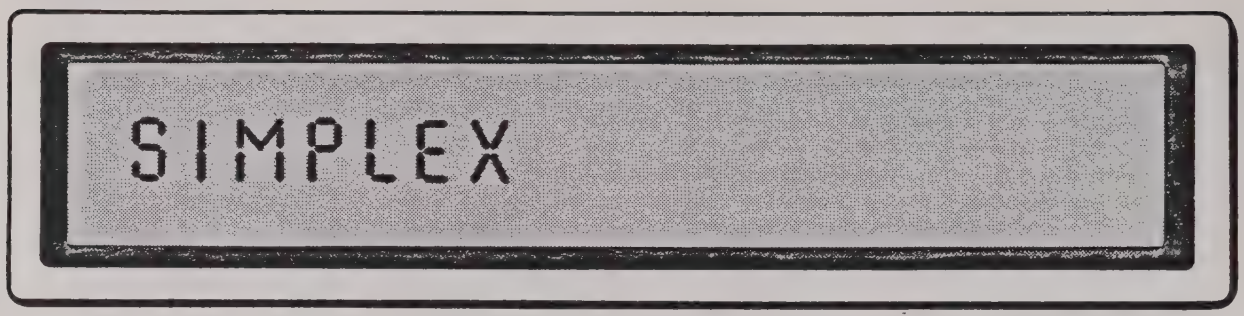

Fig. 2-12 Trunk Type Entry

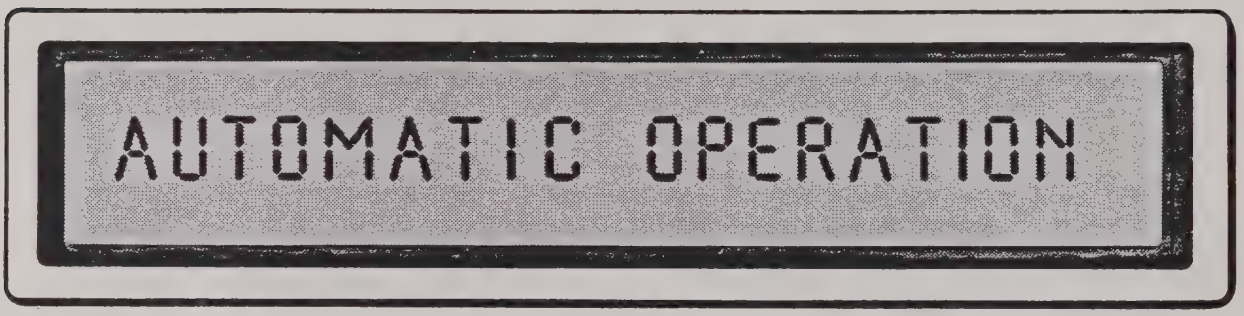

Fig. 2-13 Automatic Sequencing, Error Detection

2.38 RING FWD sends .1 second of 1300 Hz.

2.39 SW HOOK (switch hook) changes the Manual Interrogator's state from on-hook to off-hook or vice-versa, depending on the present state. When going on-hook after controlling a ROTL, the tone disconnect signal is sent automatically.

3. TYPICAL OPERATING SEQUENCES

A. Near-end Responder Mode -- Trunk Circuit

3.01 The following information describes the operating sequences of the Manual Interrogator when serving as a near-end responder on a trunk circuit:

STEP	ACTION	VERIFICATION
Set-up		
1	Set the Manual Interrogator on a convenient surface.	
2	Using the supplied power cord, connect it to a 115 VAC, 60 Hz outlet.	
3	Insert a 310 plug from a patch cord connected to a trunk test jack into the jack marked TRS on the front panel.	

STEP	ACTION	VERIFICATION
4	Turn on power switch marked ON/OFF located to the rear of the Manual Interrogator. Self-checks of the circuitry will be automatic.	The pilot lamp in switch will light. The display panel will read MANUAL INTERROGATOR.
5	Manual Interrogator goes through self-checks.	
6	Manual Interrogator is ready for operation as a near-end responder.	
7	Basic set-up is the same for any of the Manual Interrogator capabilities.	
8	To get into the near-end mode, depress the MODE button.	NEAR-END RESPONDER appears in the display. The near-end responder message appears automatically in the display the first time the MODE key is depressed. **Note:** For any of the other Manual Interrogator capabilities, depress the OPTION key until the desired capability appears in the display.
9	To prepare the Manual Interrogator for tests, depress the TESTS key. The Manual Interrogator is then automatically set up to conduct Loss, Noise, and Both. If only a specific test is desired, depress the OPTION key followed by the FIELD key to select the desired test.	LOSS NOISE BOTH will appear in the display. By depressing the OPTION and FIELD keys, specifics such as noise, loss, or both will be displayed.
10	Enter the far-end test line (FETL) number by depressing the FETL key and entering the desired number. Then depress the FIELD key to select the type of signal required.	Display will show the access number. DP or MF will appear after the FIELD key signal selection.

STEP	ACTION	VERIFICATION
11	Depress the TRUNK key to select the type of trunk being tested.	Depress the OPTION key until the desired trunk selection appears in the display. LOOP or SIMPLX are examples of the display reading.
12	Next, depress the SW HOOK key to seize a trunk.	SLEEVE, FWD BAT, and RVRS BAT indicators show the status of the trunk circuit.
13	Outpulse to the far-end by depressing the SEND key.	Outpulsing is heard on a speaker. When the far-end test line answers, tone is heard (TPT or milliwatt).
14	Depress the START key to begin transmission testing. Repeat for each test.	MF commands are heard. Far-end FSK is heard. Test results are displayed.
15	Depress RELEASE.	Release MF is heard. Far-end disconnects.
16	Depress SW HOOK.	Trunk is released.

B. **Far-end Responder Mode**

3.02 The following information describes the operating sequence for the Manual Interrogator in the far-end mode.

STEP	ACTION	VERIFICATION
1	To get the Manual Interrogator into the far-end mode, depress the MODE key, then depress the OPTION key until the desired mode appears in the display.	Display will read FAREND RESPONDER.
2	The far-end mode allows the 1056A responder to be accessed as a far-end 105 test line/responder.	
3	Depress the AUTO key.	Display shows FAREND IDLE.

STEP	ACTION	VERIFICATION
4	The Manual Interrogator is now ready to accept an incoming call as a far-end 105 test line/responder.	

C. **ROTL Test Set Mode**

3.03 The following describes the operating sequence of the Manual Interrogator in the ROTL Test Set Mode.

STEP	ACTION	VERIFICATION
Access		
1	To get the Manual Interrogator into the ROTL Test Set Mode or capability, depress the MODE key, then depress the OPTION key until the desired mode appears in the display.	The display will read ROTL TEST SET.
2	Depress the ACCESS display key and input the appropriate ROTL system access number using the numeric keys.	Access number will appear in the display (e.g. 1 512 555 1212).
3	If DP dialing is desired, depress the FETL key followed by the FIELD key.	DP appears in the display.
Priming		
4	Depress the PRIME display key and numerically enter the priming digits.	Priming digits will appear in the display. **Note:** To obtain a workable set of priming digits for your system, the Priming Formats in Part 5, Tables A-P, should be consulted. Remember, the KP and ST are included internally and cannot be entered.
Test Preparation		
5	Depress the PREP display key.	Display will read 900 0 105.

STEP	ACTION	VERIFICATION
6	If displayed prep is not desired, change by alternating depressions of the PREP key followed by the OPTION key.	
Test Mode		
7	Depress the TESTS key.	Display reads LOSS NOISE BOTH.
8	By depressing the FIELD and OPTION keys alternately, the test mode can be changed.	Display indicates test or tests selected.
Performing Tests		
9	Depress the SW HOOK key.	Dial tone is heard.
10	Depress the ACCESS key followed by the SEND key.	Outpulsing is heard, followed by TPT when the ROTL answers.
11	Depress the PRIME key followed by the SEND key after TPT stops.	TPT is heard when: (a) The TUT is seized. (b) The far-end responder is answered. (c) Near-end responder is attached.
12	Depress the START key for each test desired.	For each test run, the outgoing MF commands and returned FSK data are heard. The test results are displayed and a tape is printed out with the recorded self-checks and measurements for loss, noise, noise with tone, and gain/-slope. **Note:** A tape is printed only when the Manual Interrogator is attached to the user's printing device by connection to the Manual Interrogator's RS232 serial output port.
13	Following the last test, depress the RELEASE key.	The responders are released and TPT is heard. The ROTL remains ready for additional priming and testing.

STEP	ACTION	VERIFICATION
14	When all desired testing is completed, depress the SW HOOK key.	Two second disconnect tone is heard followed by hang-up.

D. Milliwatt Source

3.04 The following describes the operating sequence of the Manual Interrogator in the Milliwatt Source Mode.

STEP	ACTION	VERIFICATION
1	To get the Manual Interrogator into the Milliwatt Source mode, depress the MODE key until the desired mode appears in the display.	Display will read MILLIWATT ACTIVE.
2	For manual activation depress the SW HOOK key. The Manual Interrogator will go off-hook and transmit 1004 Hz 0 dBm to tip and ring.	The transmission will continue until the SW HOOK key is depressed. The display will then read MILLIWATT IDLE.

4. EXTERNAL CONNECTIONS

A. General

4.01 External signal connections consist of the modular phone jack (marked LINE), the jack marked TRS, and the terminal post (marked CO GROUND). Other external connections include a 25 pin D-subminiature connector (marked PRINTER), and another terminal post (marked ANI) is provided for the automatic number identification lead (see Fig. 2-14).

B. Modular Phone Jack

4.02 The modular phone jack is a standard RJ 11-C line cord-compatible 6 position jack with only 4 wire positions terminated.

4.03 Tip and ring are connected to the red and green leads from the modular jack. The yellow and black leads are not connected.

4.04 The off-hook function connects tip and ring through hold coil.

C. Jack and Terminal Post

4.05 The tip and ring leads from the jack are wired in parallel to the tip and ring leads from the modular phone jack.

4.06 The sleeve lead of the jack is connected through a relay to a terminal post. The terminal should be wired to frame ground for proper seizure of the ROTL or trunk when accessed at the frame.

4.07 The off-hook function connects tip and ring through hold coil and also connects the sleeve lead to the terminal post (CO GROUND).

D. EIA Connector

4.08 The EIA connection is an electronics industry standard 25 pin female subminiature D connector. Electrical connects are compatible with the Electronics Industries Association (EIA) RS-232-C standard interface.

4.09 With the EIA connector, the Manual Interrogator acts as a mini-controller and can be remotely controlled. The connector can be plugged directly to a terminal, but requires cross wiring to connect a modem.

4.10 Fig. 2-15 is a list of signal connections with the pin assignments in the left hand column. The cross wiring (null modem) necessary to wire a cable for connecting the Manual Interrogator to an APC ROTL or modem is shown in the right hand column.

5. PRIMING FORMATS

5.01 Tables A through P contain the priming formats for the listed switching systems (See Fig. 2-16).

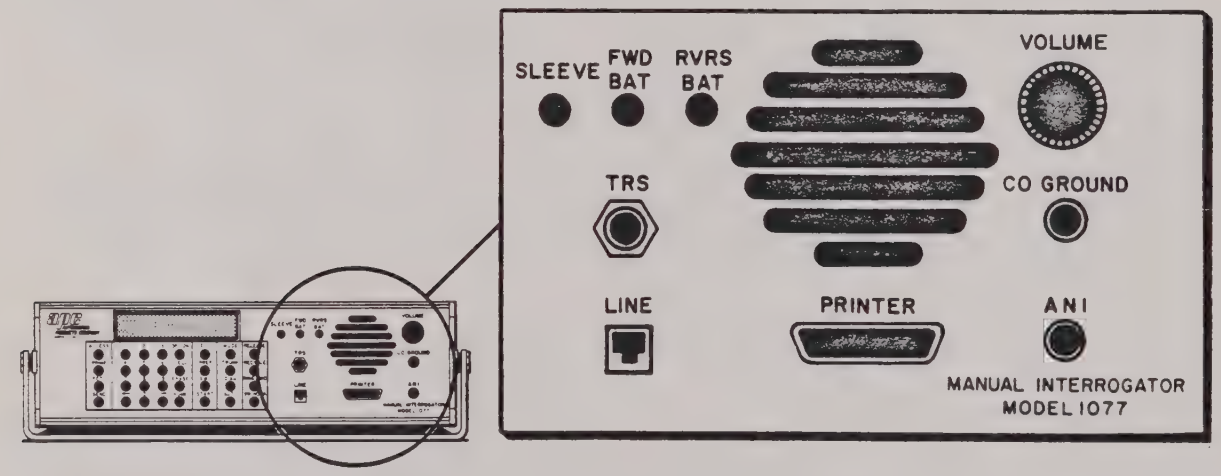

Fig. 2-14 External Connections

EIA PIN #	FUNCTION	ROTL EIA CARD OR MODEM PIN #
1	Protective Ground	1
2	Transmit Data (TX DATA)	3
3	Receive Data (RX DATA)	2
4	Request to Send (RTS)	5
5	Clear to Send (CTS)	4
6	Data Set Ready (DSR)	6
7	Signal Ground	7
8	Data Carrier Detect (DCD)	20
20	Data Terminal Ready (DTR)	8

Fig. 2-15 EIA/Modem Signal Connections

TABLE	TYPE OFFICE AND PRIMING DIGITS	FORMAT
A.	Step-by-Step	MINI-ROTL (APC)
B.	Step-by-Step	MINI-ROTL (WECO)
C.	Step-by-Step	EXPANDED ROTL (APC)
D.	Step-by-Step	EXPANDED ROTL (WECO)
E.	No. 1 CROSSBAR & CROSS-BAR TANDEM OFFICES	EXPANDED ROTL (WECO)
F.	No. 5 CROSSBAR	EXPANDED ROTL (WECO)
G.	#1 EAX & SP1	EXPANDED ROTL (APC)
H.	#2 EAX	EXPANDED ROTL (APC)
I.	#3 EAX	EXPANDED ROTL (APC)
J.	No. 1 ESS	EXPANDED ROTL (WECO)
K.	No. 2 ESS	EXPANDED ROTL (WECO)
L.	No. 4 ESS	EXPANDED ROTL (WECO)
M.	NX-1	EXPANDED ROTL (APC)
N.	DCO, GTD-5 & DSS-1210	EXPANDED ROTL (APC)
O.	DMS 100/200	EXPANDED ROTL (APC)
P.	All Offices	SMALL ROTL (WECO)

Note: WECO stands for Western Electric Company

Fig. 2-16 Type Office and Priming Format

TABLE A

SXS MINI-ROTL PRIMING DIGITS FORMAT (APC)

TYPE TEST	TEST LINE	DIGITS KP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	ST
TRANSMISSION TESTS	100	KP	0	0	TRUNK ADDRESS				TRUNK CLASS	FAR-END TEST LINE NUMBER											ST
	102	KP	0	2																	ST
	105	KP	0	5																	ST
OPERATIONAL TESTS	NON-SYNC	KP	2	0																	ST
	SYNC	KP	2	1																	ST
	103	KP	2	3																	ST
TERMINAL BALANCE TEST		KP	4	0																	ST
CONNECTION APPRAISAL TESTS	100	KP	6	0	FAR-END TEST LINE NUMBER																ST
	102	KP	6	2																	ST
	105	KP	6	5																	ST

TABLE B

SXS MINI-ROTL PRIMING DIGITS FORMAT (WECO)

TYPE TEST	TEST LINE	DIGITS KP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	ST
TRANSMISSION TESTS	100	KP	0	0	ALWAYS 0	TRUNK IDENTITY			SEE NOTE	FAR-END TEST LINE NUMBER											ST
	102	KP	0	2																	ST
	105	KP	0	5																	ST
OPERATIONAL TESTS	NON-SYNC	KP	2	0																	ST
	SYNC	KP	2	1																	ST
	103	KP	2	3																	ST
TEMINAL BALANCE TEST	WITH TUT SUPERVISION	KP	4	0																	ST
	WITHOUT TUT SUPERVISION*	KP	4	2																	ST
CONNECTION APPRAISAL TEST	100	KP	6	0	FAR-END TEST LINE NUMBER															ST	
	102	KP	6	2																ST	
	105	KP	6	5																ST	
HOME OFFICE TEST LINES (Restricted to ROTL 3 105 Inputs)	105	KP	7	5	0	TEST LINE IDENTITY			CLASS 0,2 or 5	ST											

*Provides access to MCI/RCU or RCP to allow for pulsing tests of outgoing trunks.

NOTE: The signal class digits are as follows

DIGITS	TRUNK CLASS TYPE
0	Dial Pulse Loop supervision
1	Dial Pulse Loop supervision Stop Dial
2	Dial Pulse Simplex supervision
3	Dial Pulse Simplex with Stop Dial
4	MF signaling - Loop supervision
5	MF signaling - Simplex supervision

TABLE C
MODEL 1053 SXS ROTL PRIMING DIGITS FORMAT (APC)

TYPE TEST	TEST LINE	DIGITS																							
		KP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	ST
TRANSMISSION TESTS	100	KP	0	0	TRUNK ADDRESS					TRUNK CLASS	FUTURE					FAR-END TEST LINE NUMBER									ST
	102	KP	0	2																					ST
	105	KP	0	5																					ST
OPERATIONAL TESTS	NON-SYNC	KP	2	0																					ST
	SYNC	KP	2	1																					ST
	103	KP	2	3																					ST
TERMINAL BALANCE TEST		KP	4	0																					ST
CONNECTION APPRAISAL TEST	100	KP	6	0	FAR-END TEST LINE NUMBER																				ST
	102	KP	6	2																					ST
	105	KP	6	5																					ST

TABLE D
SXS OFFICES EXPANDED ROTL PRIMING DIGITS FORMAT (WECO)

TYPE TEST	TEST LINE	DIGITS																		
		KP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	ST
TRANSMISSION TESTS	100	KP	0	0	TRUNK IDENTITY				SEE NOTE	FAR-END TEST LINE NUMBER										ST
	102	KP	0	2																ST
	105	KP	0	5																ST
OVERRIDE OOS	100	KP	1	0																ST
	102	KP	1	2																ST
	105	KP	1	5																ST
OPERATIONAL TESTS	NON-SYNC	KP	2	0																ST
	SYNC	KP	2	1																ST
	103	KP	2	3																ST
OVERRIDE OOS	NON-SYNC	KP	3	0																ST
	SYNC	KP	3	1																ST
	103	KP	3	3																ST
TERMINAL BALANCE TEST		KP	4	0																ST
OVERRIDE OOS		KP	4	1																ST
MAKE BUSY (OOS) REMOTELY		KP	5	0					ST											
RESTORE IDLE REMOTELY		KP	5	1					ST											
INDIVIDUAL TRUNK STATUS		KP	5	2					ST											
TRUNK GRP STATUS BY TRK		KP	5	3					ST											
CALL BACK REQUEST		KP	5	5	ID	ST														
CONNECTION APPRAISAL TEST	100	KP	6	0	FAR-END TEST LINE NUMBER														ST	
	102	KP	6	2															ST	
	105	KP	6	5															ST	
HOME OFFICE TEST LINES	100	KP	7	0	TEST LINE IDENTITY				CLASS 0, 2, 8, 6	ST										
	SYNC	KP	7	1						ST										
	102	KP	7	2						ST										
	103	KP	7	3						ST										
	NON-SYNC	KP	7	4						ST										
	105	KP	7	5						ST										

NOTE: The signal class digits are as follows

DIGITS	TRUNK CLASS TYPE
0	Dial Pulse Loop supervision
1	Dial Pulse Loop supervision Stop Dial
2	Dial Pulse with Simplex supervision
3	Dial Pulse Simplex with Stop Dial
4	MF signaling - Loop supervision
5	MF signaling - Simplex supervision
6	Home office Test of test line on selector banks
9	SAMA Trunks

TABLE E

NO.1 X-BAR & X-BAR TANDEM OFFICES ROTL PRIMING DIGITS FORMAT (WECO)

TYPE TEST	TEST LINE	DIGITS																
		KP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	ST
TRANSMISSION TESTS	100	KP	0	0	TRUNK IDENTITY (5 DIGITS)					TYPE OF PULSING (2 DIGITS SEE NOTE)		FAR-END TEST LINE NUMBER (3,4,5 or 7 DIGITS)							ST
	102	KP	0	2															ST
	105	KP	0	5															ST
OVERRIDE OOS	100	KP	1	0															ST
	102	KP	1	2															ST
	105	KP	1	5															ST
OPERATIONAL TESTS	NON-SYNC	KP	2	0															ST
	SYNC	KP	2	1															ST
	103	KP	2	3															ST
OVERRIDE OOS	NON-SYNC	KP	3	0															ST
	SYNC	KP	3	1															ST
	103	KP	3	3															ST
TERMINAL BALANCE TEST		KP	4	0															ST
OVERRIDE OOS		KP	4	1															ST
INDIVIDUAL TRUNK STATUS		KP	5	2						ST									
CONNECTION APPRAISAL TEST	100	KP	6	0	FAR-END TEST LINE NUMBER (7,8,10 or 11 DIGITS)														ST
	102	KP	6	2															ST
	105	KP	6	5															ST

NOTE:

DIGITS	TYPE OF PULSING	
	PULSING	SUPERVISION
00	MF	Wink Start
01		Stop-Go Outpulsing
02		Delay Dial
03		Delay Dial (2W)
10	DP Loop A	Wink Start
11		Stop-Go Outpulsing
12		Delay Dial
19		Delay Dial (2W)
13	DP Loop B	Wink Start
14		Stop-Go Outpulsing
15		Delay Dial
16	DP Bat. & Grd.	Wink Start
17		Stop-Go Outpulsing
18		Delay Dial
20	RP	Panel (24V)
21		X-Bar (48V Panel, ESS, X-Bar)
22		Panel, Loop Comp. Res. -200
23		X-Bar Loop Comp. Res. -300
24	RP	Panel, Loop Comp. Res. -600
25		X-Bar, Loop Comp. Res. -600
26		Panel, Loop Comp. Res. -900
27		X-Bar, Loop Comp. Res. -900
30	PCI	PCI, Loop Comp. Res. -000
31		PCI, Loop Comp. Res. -300
32		PCI, Loop Comp. Res. -600
33		PCI, Loop Comp. Res. -900
40	RP	2nd X-Bar in same office Res. -000
41		2nd X-Bar in same office Res. -300
42		2nd X-Bar in same office Res. -600
43		2nd X-Bar in same office Res. -900

TABLE F
NO. 5 CROSSBAR ROTL PRIMING DIGITS FORMAT (WECO)

ROTL TEST SET MF DIGITS SWITCH	MF DIGIT FUNCTIONS	ROTL REGISTER ACTIONS	DIGITS 0	1	2	3	4	5	6	7	8	9	SEE NOTE
1 (ITC-)	TEST CLASS	Registar Relays Operated Type of XMSM, OP Seizure	XMSM Test	XMSM No Test	OP Test	OP No Test	BAL	MB UL ULP	CA	Home Office Test Line			
2 (2TC-)	TEST CLASS	Type of XMSM or CA Test Line	100		102			105					4
		Type of OP Test Line	Non Sync	Sync		103	Non Sync						
		Type of Balance Seizure	Test	No Test									
		Type of MB Call	Make Busy	Re-lease	Inter-rogate Trk	Inter-rogate Trk Grp		OPR, UL ULA, (Call Back Verif)					
3 (TYP-)	TYPE OF CALL	Type of Orig Test Line	Local Orig (LOTL)	Toll Orig (TOTL)	Term to PBX (LLP TRM)		Term to Home Test Line			CCSA (TOTL)	Tandem (TOTL)	CCSA (LOTL)	
	ORIG OFFICE IDENT		0	1	2	3	4	5	6	7	8	9	
4 (TR-)	TYPE OF TRANSLATOR	Marker Leads Grounded LOTL	LT	LT1	LT2	LT3	2DT	X11				FVD	9
		TOTL/TRM	LT						OA	OB	TT	FVD	
5 (MG-)	MARKER GROUP	Marker Group	00	100	200		00	100	200	00	100	200	
		2W 4W Marker	2W	2W	2W		2W	2W	2W	4W	4W	4W	
		Coin/Non-Coin	Non Coin	Non Coin	Non Coin		Coin	Coin	Coin	Non Coin	Non Coin	Non Coin	
6 (CTA-)	CLASS OF SERVICE TENS/TANDEM SCREENING	Marker Leads Grounded LOTL	CTA4,7	CTA0,1	CTA0,2	CTA1,2	CTA0,4	CTA1,4	CTA2,4	CTA0,7	CTA1,7	CTA2,7	
		TOTL, TRM	TAN	TAN1	TAN2	TAN3	TAN4	TOL	INC	PCR	PCD	PCD1	
7 (CU-)	CLASS OF SERVICE UNITS	Marker Leads Grounded LOTL	CU4,7	CU0,1	CU0,2	CU1,2	CU0,4	CU1,4	CU2,4	CU0,7	CU1,7	CU2,7	1,3
8 (CRU-)	RATE TREATMENT UNITS	Marker Leads Grounded LOTL	SEE NOTE 6 CRU4,7	CRU0,1	CRU0,2	CRU1,2	CRU0,4	CRU1,4	CRU2,4	CRU0,7	CRU1,7	CRU2,7	1,3
9 (CG-)	RATE TREATMENT TENS/TRUNK CLASS GROUP	Marker Leads Grounded LOTL			SEE NOTE 7 CGA, OR	CGB OR	CGA FAC	SEE NOTE 8 CGB, FAC					
		TOTL	TCA	TCB									
10 (RA-)	ROUTE ADVANCE & GROUP ALLOTTER	LOTL or TOTL No. of Route Advances	0	1	2	3		0	1	2	3		1,5
		Allotter Group	GPA	GPA	GPA	GPA		GPB	GPB	GPB	GPB		
11 (TI-)	TRUNK SELECTION TENS INFO/HOLD MAGNET NO. OF LLP TRK ON LINE SWITCH OF LINE LINK FRAME	Marker Leads Grounded LOTL/TOTL TLF TENS	FG0	FG1	FG2	FG0	FG1	FG2					2,5
		TRK TENS	0	0	0	1	1	1					
		TERM	S0	S1	S2	S3	S4	S5	S6	S7	S8	S9	
12 (TF-)	TRUNK LINK FRAME UNITS/ HUNDREDS BLOCK NO. ASSOC WITH LLP TRUNK IN NO. GROUP	Marker Leads Grounded LOTL/TOTL: TLF UNITS	TF4,7	TF0,1	TF0,2	TF1,2	TF0,4	TF1,4	TF2,4	TF0,7	TF1,7	TF2,7	2,5
		TRM	TBT0	TBT1	TBT2	TBT3	TBT4	TBT5	TBT6	TBT7	TBT8	TBT9	
13 (TT-)	TRUNK NO. UNITS TENS BLOCK NO ASSOC. WITH LLP TRUNK IN NO. GROUP	LOTL/TOTL	TT0	TT1	TT2	TT3	TT4	TT5	TT6	TT7	TT8	TT9	2,5
		TRM	TBU0	TBU1	TBU2	TBU3	TBU4	TBU5	TBU6	TBU7	TBU8	TBU9	
14-23 (A-K 2/5)	FAR-END TEST LINE NO.	Marker Leads Grounded:	(A-K) 4,7	(A-K) 0,1	(A-K) 0,2	(A-K) 1,2	(A-K) 0,4	(A-K) 1,4	(A-K) 2,4	(A-K) 0,7	(A-K) 1,7	(A-K) 2,7	

NOTES
1. Not required on TRM class calls.
2. Not required on TRM class calls to home office test lines.
3. Not required on TOL and TAN class calls.
4. Digit 0 - Non-Syn. when digit 2 or 3 is reg. as ITC digit. Digit 4 - Non-Syn. when digit 7 is reg. as ITC digit.
5. Not required on CA (connection appraisal) calls.
6. When marker group is not arranged for rate treatment, ROTL must be primed with digit 0.
7. When marker group is not arranged for either rate treatment or 60 classes of service and a numbering plan area code is not used as part of the called number (address), ROTL must be primed with digit 2.
8. When marker group is not arranged for either rate treatment or 60 classes of service and a numbering plan area code is used as part of the called number (address), ROTL must be primed with digit 4.
9. Terminating calls to home office test lines may utilize a 4 digit terminating number with either an OA or OB indication, or a 5 digit terminating number with a FVD indication, or a 7 digit terminating number with a LT indication.

TABLE G

*1 EAX AND SP1 PRIMING DIGITS FORMAT (APC)

TYPE TEST	TEST LINE	KP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	ST
TRANSMISSION TESTS	100	KP	0	0	MODIFIER DIGIT (SEE NOTE)	TRUNK GROUP NUMBER			TRUNK GROUP MEMBER NUMBER			FAR-END TEST LINE NUMBER (≤11 DIGITS)											ST
	102	KP	0	2																			ST
	105	KP	0	5																			ST
OVERRIDE OOS	100	KP	1	0																			ST
	102	KP	1	2																			ST
	105	KP	1	5																			ST
OPERATIONAL TESTS	NON-SYNC	KP	2	0																			ST
	SYNC	KP	2	1																			ST
	103	KP	2	3																			ST
OVERRIDE OOS	NON-SYNC	KP	3	0																			ST
	SYNC	KP	3	1																			ST
	103	KP	3	3																			ST
TERMINAL BALANCE TEST		KP	4	0																			ST
OVERRIDE OOS		KP	4	1																			ST

NOTE: 4th digit is a modifier digit:
a) 0 = Talk tandem off-hook state without a transformer in the talking path.
b) 1 = Talk tandem off-hook state with a transformer in the talking path.

This option is unused in the *1 EAX, but must be included for CAROT compatability; therefore the 4th digit will be a 0 but never examined by the *1 EAX.

TABLE H

MODEL 1058 *2 EAX ROTL/52A PRIMING DIGITS FORMAT (APC)

TYPE TEST	TEST LINE	KP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	ST
TRANSMISSION TESTS	100	KP	0	0	MODIFIER DIGIT (SEE NOTE)	TRUNK GROUP NUMBER			TRUNK GROUP MEMBER NUMBER			FAR-END TEST LINE NUMBER (≤11 DIGITS)												ST
	102	KP	0	2																				ST
	105	KP	0	5																				ST
OVERRIDE OOS	100	KP	1	0																				ST
	102	KP	1	2																				ST
	105	KP	1	5																				ST
TERMINAL BALANCE TEST		KP	4	0																				ST
OVERRIDE OOS		KP	4	1																				ST
MAKE BUSY (OOS) REMOTELY		KP	5	0								ST												
RESTORE IDLE REMOTELY		KP	5	1								ST												
INDIVIDUAL TRUNK STATUS		KP	5	2								ST												
TRUNK GRP STATUS BY TRK		KP	5	3								ST												
TRUNK GRP STATUS BY GRP		KP	5	4					ST															
CALL BACK REQUEST		KP	5	5	ID	ST																		
CONNECTION APPRAISAL TEST	100	KP	6	0	FAR-END TEST LINE NUMBER (≤12 DIGITS)																			ST
	102	KP	6	2																				ST
	105	KP	6	5																				ST
HOME OFFICE TEST LINES	100	KP	7	0	NOTE	TRUNK GROUP AND MEMBER						ST												
	102	KP	7	2								ST												
	103	KP	7	3								ST												
	NON-SYNC	KP	7	4								ST												
	105	KP	7	5								ST												

NOTE: 4th digit is a modifier digit:
a) 0 = Talk tandem off-hook state without a transformer in the talking path.
b) 1 = Talk tandem off-hook state with a transformer in the talking path.

TABLE I

MODEL 1057 #3 EAX ROTL/52A PRIMING DIGITS FORMAT (APC)

TYPE TEST	TEST LINE	DIGITS
TRANSMISSION TESTS	100	KP 0 0 TRUNK GROUP NUMBER TRUNK GROUP MEMBER NUMBER REMOTE TEST LINE NUMBER (≤12 DIGITS) ST
	102	KP 0 2 ST
	105	KP 0 5 ST
OVERRIDE OOS	100	KP 1 0 ST
	102	KP 1 2 ST
	105	KP 1 5 ST
OPERATIONAL TESTS	NON-SYNC	KP 2 0 ST
	SYNC	KP 2 1 ST
	103	KP 2 3 ST
OVERRIDE OOS	NON-SYNC	KP 3 0 ST
	SYNC	KP 3 1 ST
	103	KP 3 3 ST
MAKE BUSY (OOS) REMOTELY		KP 5 0 ST
RESTORE IDLE REMOTELY		KP 5 1 ST
INDIVIDUAL TRUNK STATUS		KP 5 2 ST
TRUNK GRP STATUS BY TRK		KP 5 3 ST
TRUNK GRP STATUS BY GRP		KP 5 4 ST
CALL BACK REQUEST		KP 5 5 ID ST
HOME OFFICE TEST LINES	100	KP 7 0 TRUNK GROUP AND MEMBER ST
	102	KP 7 2 ST
	103	KP 7 3 ST
	105	KP 7 5 ST

TABLE J

NO.1 ESS ROTL PRIMING DIGITS FORMAT (WECO)

TYPE TEST	TEST LINE	DIGITS
TRANSMISSION TESTS	100	KP 0 0 MODIFIER DIGIT (SEE NOTE) TRUNK NETWORK NUMBER FAR-END TEST LINE NUMBER (≤11 DIGITS) ST
	102	KP 0 2 ST
	105	KP 0 5 ST
OVERRIDE OOS	100	KP 1 0 ST
	102	KP 1 2 ST
	105	KP 1 5 ST
TERMINAL BALANCE TEST		KP 4 0 ST
OVERRIDE OOS		KP 4 1 ST
MAKE BUSY (OOS) REMOTELY		KP 5 0 ST
RESTORE IDLE REMOTELY		KP 5 1 ST
INDIVIDUAL TRUNK STATUS		KP 5 2 ST
TRUNK GRP STATUS BY GRP		KP 5 4 ST
CALL BACK REQUEST		KP 5 5 ID ST
CONNECTION APPRAISAL TEST	100	KP 6 0 FAR-END TEST LINE NUMBER (≤12 DIGITS) ST
	102	KP 6 2 ST
	105	KP 6 5 ST
HOME OFFICE TEST LINES	100	KP 7 0 (NOTE) TEST LINE DIRECTORY NUMBER ST
	103	KP 7 2 ST
	105	KP 7 5 ST

NOTE: 4th digit is a modifier digit:
a) 0 = Local originating mode.
b) 1 = Tandem 1 (2-wire tandem configuration with transformers).
c) 2 = Tandem 2 (4-wire to 2-wire tandem configuration without transformer).

TABLE K

NO. 2 ESS ROTL PRIMING DIGITS FORMAT (WECO)

TYPE TEST	TEST LINE	KP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	ST
TRANSMISSION TESTS	100	KP	0	0	MODIFIER DIGIT (SEE NOTE)	TRUNK GROUP NUMBER			TRUNK GROUP MEMBER NUMBER			FAR-END TEST LINE NUMBER (≤11 DIGITS)											ST
	102	KP	0	2																			ST
	105	KP	0	5																			ST
OVERRIDE OOS	100	KP	1	0																			ST
	102	KP	1	2																			ST
	105	KP	1	5																			ST
TERMINAL BALANCE TEST		KP	4	0																			ST
OVERRIDE OOS		KP	4	1																			ST
MAKE BUSY(OOS)REMOTELY		KP	5	0								ST											
RESTORE IDLE REMOTELY		KP	5	1								ST											
INDIVIDUAL TRUNK STATUS		KP	5	2								ST											
TRUNK GRP STATUS BY TRK		KP	5	3								ST											
TRUNK GRP STATUS BY GRP		KP	5	4								ST											
CALL BACK REQUEST		KP	5	5	ID*	ST																	
CONNECTION APPRAISAL TEST	100	KP	6	0	FAR-END TEST LINE NUMBER (≤12 DIGITS)																		ST
	102	KP	6	2																			ST
	105	KP	6	5																			ST
HOME OFFICE TEST LINES	100	KP	7	0	TEST LINE DIRECTORY NUMBER							ST											
	103	KP	7	2								ST											
	105	KP	7	5								ST											

NOTE: 4th digit is a modifier digit:
a) 0= Talk tandem off-hook state without a transformer in the talking path.
b) 1 = Talk tandem off-hook state with a transformer in the talking path.
* ID is a test center identifier (0-7) for call back.

TABLE L

NO. 4 ESS ROTL PRIMING DIGITS FORMAT (WECO)

TYPE TEST	TEST LINE	KP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	ST
TRANSMISSION TESTS	100	KP	0	0	TRUNK IDENTITY FOR TRUNK APPEARANCE NUMBER							FAR-END TEST LINE NUMBER(≤7 DIGITS)							ST
	102	KP	0	2															ST
	105	KP	0	5															ST
OVERRIDE OOS	100	KP	1	0															ST
	102	KP	1	2															ST
	105	KP	1	5															ST
MAKE BUSY(OOS)REMOTELY		KP	5	0								ST							
RESTORE IDLE REMOTELY		KP	5	1								ST							
INDIVIDUAL TRUNK STATUS		KP	5	2								ST							
TRUNK GRP STATUS BY TRK		KP	5	3								ST							
TRUNK GRP STATUS BY GRP		KP	5	4	NOTE 1						ST								
CALL BACK REQUEST		KP	5	5	NOTE 2				ST										
HOME OFFICE TEST LINES	100	KP	7	0	ST														
	102	KP	7	2	ST														
	105	KP	7	5	NOTE 3						ST								

NOTES:
1. Trunk subgroup number (4 octal digits).
2. Control or caller identification (only values 0 through 7 are valid)
3. Seven digit decimal trunk appearance number (for 105-test line responsibility).

TABLE M
NX-1 ROTL PRIMING DIGITS FORMAT (APC)

TYPE TEST	TEST LINE	DIGITS																							
		KP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	ST
TRANSMISSION TESTS	100	KP	0	0	TRUNK ADDRESS					TRUNK CLASS	TRUNK TYPE	INLET NUMBER		FUTURE		FAR-END TEST LINE NUMBER										ST
	102	KP	0	2																						ST
	105	KP	0	5																						ST
OPERATIONAL TESTS	NON-SYNC	KP	2	0																						ST
	SYNC	KP	2	1																						ST
	103	KP	2	3																						ST
TERMINAL BALANCE TEST		KP	4	0																						ST
CONNECTION APPRAISAL TEST	100	KP	6	0	FAR-END TEST LINE NUMBER																					ST
	102	KP	6	2																						ST
	105	KP	6	5																						ST

TABLE N
DCO, GTD-5, DSS-1210 PRIMING DIGITS FORMAT (APC)

TYPE TEST	TEST LINE	DIGITS																					
		KP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	ST
TRANSMISSION TESTS	100	KP	0	0	MODIFIER DIGIT (SEE NOTE)	TRUNK GROUP NUMBER			TRUNK GROUP MEMBER NUMBER			FAR-END TEST LINE NUMBER (≤11 DIGITS)											ST
	102	KP	0	2																			ST
	105	KP	0	5																			ST
OVERRIDE OOS	100	KP	1	0																			ST
	102	KP	1	2																			ST
	105	KP	1	5																			ST
OPERATIONAL TESTS	NON-SYNC	KP	2	0																			ST
	SYNC	KP	2	1																			ST
	103	KP	2	3																			ST
OVERRIDE OOS	NON-SYNC	KP	3	0																			ST
	SYNC	KP	3	1																			ST
	103	KP	3	3																			ST
TERMINAL BALANCE TEST		KP	4	0																			ST
OVERRIDE OOS		KP	4	1																			ST
MAKE BUSY (OOS) REMOTELY		KP	5	0								ST											
RESTORE IDLE REMOTELY		KP	5	1								ST											
INDIVIDUAL TRUNK STATUS		KP	5	2								ST											
TRUNK GRP STATUS BY TRK		KP	5	3								ST											
TRUNK GRP STATUS BY GRP		KP	5	4							ST												
CALL BACK REQUEST		KP	5	5	ID	ST																	
CONNECTION APPRAISAL TEST	100	KP	6	0	FAR-END TEST LINE NUMBER (≤12 DIGITS)																		ST
	102	KP	6	2																			ST
	105	KP	6	5																			ST
HOME OFFICE TEST LINES	100	KP	7	0	(NOTE)	TRUNK GROUP AND MEMBER							ST										
	102	KP	7	2									ST										
	103	KP	7	3									ST										
	NON-SYNC	KP	7	4									ST										
	105	KP	7	5									ST										

NOTE: 4th digit is a modifier digit:
a) 0 = Talk tandem off-hook state without a transformer in the talking path.
b) 1 = Talk tandem off-hook state with a transformer in the talking path.

TABLE 0

MODEL 1066 DMS 100/200 DIGITAL SYSTEM ROTL PRIMING DIGITS FORMAT (APC)

TYPE TEST	TEST LINE	DIGITS
		KP 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 ST
TRANSMISSION TESTS	100	KP 0 0 TRUNK GROUP NUMBER TRUNK GROUP MEMBER NUMBER ROTL Does Not Send These Digits To DMS 100/200 FAR-END TEST LINE NUMBER ST
	102	KP 0 2 ST
	105	KP 0 5 ST
OVERRIDE OOS	100	KP 1 0 ST
	102	KP 1 2 ST
	105	KP 1 5 ST
OPERATIONAL TESTS	NON-SYNC	KP 2 0 ST
	SYNC	KP 2 1 ST
	103	KP 2 3 ST
OVERRIDE OOS	NON-SYNC	KP 3 0 ST
	SYNC	KP 3 1 ST
	103	KP 3 3 ST
TERMINAL BALANCE TEST		KP 4 0 ST
OVERRIDE OOS		KP 4 1 ST
MAKE BUSY (OOS) REMOTELY		KP 5 0 ST
RESTORE IDLE REMOTELY		KP 5 1 ST
INDIVIDUAL TRUNK STATUS		KP 5 2 ST
TRUNK GRP STATUS BY TRK		KP 5 3 ST
TRUNK GRP STATUS BY GRP		KP 5 4 ST
CALL BACK REQUEST		KP 5 5 ID ST
CONNECTION APPRAISAL TEST	100	KP 6 0 FAR-END TEST LINE NUMBER (≤12 DIGITS) ST
	102	KP 6 2 ST
	105	KP 6 5 ST
HOME OFFICE TEST LINES	100	KP 7 0 TRUNK GROUP AND MEMBER ST
	102	KP 7 2 ST
	103	KP 7 3 ST
	NON-SYNC	KP 7 4 ST
	105	KP 7 5 ST

TABLE P

ALL OFFICES SMALL ROTL PRIMING DIGITS FORMAT(WECO)

TYPE TEST		PRELIM DIGIT	DIGITS A	B*	C*	D*	E*
TRANSMISSION TESTS (ATMS Responder at ROTL Office)	SERVICE SEIZURE		1				
	TEST SERVICE	4	1	SEE NOTE 1	SEE NOTE 2		SEE NOTE 3
OPERATIONAL TESTS	SERVICE SEIZURE		2				
	TEST SEIZURE	4	2				
TRANSMISSION TESTS (No ATMS Responder at ROTL Office)	SERVICE SEIZURE		3				
	TEST SEIZURE	4	3				
TERMINAL BALANCE TEST	SERVICE SEIZURE		5				
	TEST SEIZURE	4	5				
SPARE			6				
SPARE			7				
1000-Hz TONE, 1mW TO BE TRANSMITTED TOWARDS CONTROL OFFICE			8				
TRUNK RESTORE TO SERVICE			9	SEE NOTE 1	SEE NOTE 2		SEE NOTE 3
INTERROGATE BUSY STATUS OF TRUNK GROUP		4	9				
TRUNK MAKE BUSY			0				
INTERROGATE BUSY STATUS OF A TRUNK		4	0				

NOTES Apply to Step-by-Step Offices

1. Digit for one of ten test selectors.
2. Digits to step test selector to outgoing trunk to be tested.
3. Digit to designate type of pulsing.
   (a) 1 = MF Outpulsing
   (b) 2 through 0 = Dial pulsing

* Except for the 1000 Hz Tone Test, in No.5 Crossbar offices, these four digits are used to identify the location of the outgoing trunk to be tested and the directory number of the far-end test line.

MANUAL INTERROGATOR
MODEL 1077
REMOTE OPTION

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1. GENERAL

1.01 This section describes the software enhancements and communications protocol used to upgrade the current Model 1077 Manual Interrogator to the remote option capabilities. This option allows full unattended operation of the 1077 with either external playback memory or computer communications. Additionally, a remote user can command the 1077 with a terminal and a modem connection (the modem is external to the 1077). The main features provided to the user with this option are: (1) limited trunk routining capabilities provided by automatic playback of a command file prepared by the user, and (2) one port CAROT or RAMPART-compatible control functions for trunk testing when commanded by the user's computer system. Only transmission type tests are supported by the remote option.

2. COMMUNICATIONS PROTOCOL

2.01 Communications will be through an RS-232-C compatible serial asynchronous 300 baud link using 8 bit ASCII data with no parity, one start bit, and one stop bit. Total throughput is 30 characters per second.

> **Note:** The Model 1077 can communicate at either 300, 600, 1200 or 2400 baud rates. Baud rate change is accomplished by depressing the DIAG and ERASE keys.

A very simple protocol with two variations will be used. The two variations are to distinguish between human control and computer or playback storage control.

2.02 The two variations in protocol differ in the control characters used and whether data is echoed to the sender. The variations will be labeled **'computer type'** and **'human type'**. The computer type will use SOH (start of heading, HEX 01), and EOT (end of transmission, HEX 04) for initiating and terminating remote control, and DC1 (playback on, HEX 11) and DC3 (playback off, HEX 13) to start and end each command line. No received characters will be echoed to the transmitter with the computer type control. The human type control will echo everything to the transmitter and will use '>' (greater than sign, HEX 3E) to initiate remote control, and '>' and CR (carriage return, HEX 0D) to start and echo each command line. In addition, BS (backspace, HEX 08) and DEL (delete, HEX 7F) will be used for character delete and CAN (cancel, HEX 18) will be used for line delete. CR will be accepted as the line terminator with computer type control and DC3 will be required only with playback memory.

2.03 Remote control will be initiated upon receipt of the start character (SOH or >). The echo mode is set by which character is used. Any activity on the EIA port will be ignored until this character is received. This character, when received during remote operation, will cause the 1077 to abort any current activity and re-initialize for remote control. If a ROTL is accessed, a disconnect signal (2 seconds of 1300 Hz) will be sent first and the line hung up.

2.04 Once remote is initiated, the 1077 accepts commands by transmitting the start command prompt (DC1 or >) and receiving an ASCII command string containing one valid command. The command string will be terminated by receiving the end command character (DC3 or CR) and the command will then be executed. Any characters received between the end command character and the next start command prompt will be ignored except for the start remote control character (abort). The command string may contain a maximum of 44 characters.

2.05 After each command is received, it will be executed and a prompt will be issued for the next command. All commands, except the GO command, are used for setup only and return no results. The GO command will cause the current test requirements to be executed and the results returned to the remote controller. After initial setup, setup commands need be entered only when values change.

2.06 Remote control will be terminated and control returned to the 1077 keyboard when either a pushbutton on the keyboard is activated or an EOT character is received. The EOT is valid at any time during remote control and will abort any current remote operations. Again, the ROTL will be disconnected first.

2.07 Results returned to the controller will be formatted lines of ASCII text separated by CRLF (carriage return, line feed) and terminated by the start command character (DC1 or >). There will be no heading preceding the data. The format is shown in part 5, this section.

2.08 A limited echo mode will be provided for the playback storage mode and activated by the ECHO command. Though not really a character-by-character echo, setup commands will be printed out when executed to provide identification in the printout. Whenever the setup is changed, two line feeds will be printed followed by the new setup followed by two more blank lines, and then normal result logging will continue. A change in the priming field only will not activate the additional blank lines. This mode is shown in part 5, this section.

2.09 The following table is a summary of the communications protocol:

TABLE 3-1

FUNCTION	COMPUTER	HUMAN
Start Remote	SOH (01)	> (3E)
End Remote	EOT (04)	EOT (04)
Start Command (Prompt)	DC1 (11)	> (3E)
End Command	DC3 (13) or CR (0D)	CR (0D)
Echo	OFF	ON
Character Delete	None	BS (08) or DEL (7F)
Line Delete	None	CAN (18)

3. REMOTE COMMANDS

A. COMMAND FORMAT

3.01 This part describes the command format recognized by the RTS during remote operation. Unless otherwise specified, the following general guidelines apply:

A. Capitalized words representing commands and key words must be entered exactly as shown.

B. Blanks are used to separate commands words from parameters and are otherwise ignored, except that no blank may precede the command word.

C. A parenthesized list means that one option must be selected from the items in the list. The parentheses are not to be entered.

D. Each command must end with the appropriate end command character (DC3 or CR) and only one command may be entered on a line.

B. PRIME K1234567890S

3.02 The PRIME command allows entry of the priming field. Up to 30 digits may appear between K and S. Any blanks in the priming string will be significant and will cause one digit wait time to be executed with no transmission. An alternate form of this command is:

PRIME K1234

In this form, the S is not entered, meaning the remainder of the priming string is unchanged. This allows changing the first several digits that would normally contain the trunk address information while leaving the far-end test line number unchanged, which is useful for selecting the next trunk in a group.

C. ACCESS 8.1 512 258 1651 (DP)

3.03 The ACCESS command allows entry of the ROTL access number or far-end test line number. The directory number is the first digit field and will contain a '1' if DDD access is required, the area code, and the directory number. Blanks may be inserted for readability and have no effect on dialing. The optional pauses, indicated by the '.' allow outgoing access from a PBX (pause for second dial tone). More than one pause is allowed and the 1077 will wait for second dial tone before continuing dial. The DP option selects dial pulse (default is DTMF). '*' and '#' represent the special DTMF tones.

D. FETL 9591051 (DP)

3.04 The FETL commands allow the entry for the far-end test line number when the 1077 is connected to a trunk. Up to 30 digits may be entered. KP and ST are inserted automatically for MF signaling (default). DP specifies dial pulse.

E. PREP (600, 900) (0, 2) (100, 102, 105)

3.05 The PREP command selects the test preparation digit to be transmitted before each transmission test command. The first field selects the trunk impedance, the second field is the test level point, and the last field is the far-end test line type. One option is selected from each list and must be entered exactly as shown, but any order is accepted. Default values are 900 ohm, 0 dB, 105.

F. TEST LOSS, NOISE, NTONE, G/S, BAL, L04, L10, L28, ERL, SRL, and SRLHI (MEAS, S.C., or BOTH)

3.06 The TEST command selects which tests to be run. From 1 to 4 test selections any be entered in any order. The tests will be run in the order entered. Measurements, self checks, or both may be specified; BOTH is the default.

G. MODE (NEARND, FAREND, ROTLTS, MILLIW)

3.07 The MODE command sets the operating mode of the 1077. Choices are near-end responder, far-end responder, ROTL test set, or milliwatt. Default is near-end responder.

H. TRUNK (LINE, LOOP, SIMPLX) (WINK)

3.08 This command sets the type of originating circuit attached to the 1077. Subscriber line is the default. For loop or simplex trunks, an optional wink required may be specified.

I. GO

3.09 The GO command causes the current test setup to be executed. In the near-end mode, the responder will be dialed, the measurements specified will be made and the release command will be sent and the circuit hung up. In the ROTL test set mode, if the ROTL is not accessed, it will be dialed up first. Then, priming will be sent and the transmission test will be run. At the end of the test sequence the release responder command will be sent. The 1077 will now accept new commands.

J. HANGUP

3.10 The HANGUP command causes a disconnect signal to be sent to the ROTL (in the ROTL test set mode) and the phone line hung up in preparation for a new ROTL access number.

K. ECHO

3.11 The ECHO command sets the echo mode for a playback terminal. In this mode, changes in setup will be highlighted on the printout to assist in interpreting the results of a playback command file.

L. CHECK

3.12 The CHECK command runs the 1077 internal self check. The results returned consist of a single word: PASS or FAIL.

M. RETRY 1

3.13 The RETRY command specifies how many times the particular test is to be retried before reporting an error. Any failure before completing the test will cause a retry from the point of failure.

N. FIELD 9 (SXS3,SXS5)

3.14 The FIELD command specifies a digit position to be incremented sequentially when a group of tests is to be run. In the near-end mode, the field applies to the access number for a subscriber line or to the FETL for a trunk circuit. In the ROTL test set mode, the field applies to the priming. The field may be either a number or the SXS3 or SXS5 keywords. The SXS (3-wire or 5-wire) applies only to the ROTL test set mode and specifies the generation algorithm for the APC step-by-step ROTL. For the 1062 SXS mini-ROTL, a blank space must be inserted between priming digits 2 and 3 for the algorithm to work properly.

EXAMPLE:

Maxi SXS - 0501001--------
Mini SXS - 05 1001--------

If a number is specified, it indicates the digit position to be incremented sequentially for a common control application. When the digit incremented overflows, the next digit to the left is also incremented. Digit positions begin at 1 (left most) and all characters including pauses, blanks, or other non-numerics are counted. In the priming field, the KP is not counted.

O. GROUP 23

3.15 The GROUP command specifies how many sets of tests are to be run. Used in conjunction with the field

command, the priming or access numbers are updated after each test and the tests are repeated the number of times specififed by the group count. If the field is not specified, the same priming or access is used and the tests are repeated. At the end of the tests, a summary line of results is printed. The count may be from 1 to 99.

P. TIME MM/DD/YY,HH:MM:SS

3.16 This command allows for entry of the time of day to initialize the internal clock for a scheduled start.

Q. START MM/DD/YY,HH:MM:SS

3.17 The START command specifies the time to begin testing. When the GO command is entered, the 1077 waits until the start time passes to begin testing.

R. LIMITS (LOSS, NOISE, NTONE, L04, L10, L28, ERL, SRL, SRLHI)
-06.1:-5.5 (/-05.0:-04.5)

3.18 This command allows the entry of LIMIT values for test results used to determine success or failure. Each pair of numbers represents the lower and upper bounds for a particular test. The colon separates the two numbers in the pair. Each number must be prefixed by a plus or a minus sign. The limit command is entered for each test previously selected by the test command with the proper identifying keyword. Note that the gain slope and echo return loss tests are actually three tests each and three limits must be entered. The numbers must be in the format shown with no blanks, leading zeros required. The optional second pair of numbers is used if the near-to-far limit is different (defaults to same as far-to-near).

4. OUTPUT FORMAT

4.01 The output format below applies only to the computer type interface when 'ECHO' is NOT entered. A single line is returned with all test results as 5 digit numbers with leading spaces if required. The example at the bottom of this page uses the sample data of the first measurement printout shown in Fig. 3-2.

4.02 The output format shown in Fig. 3-1 is for either the human interface or the computer interface if 'ECHO' is entered. Several comments are in order. First, the setup description shown is printed only when the echo mode described above is selected. Whenever the setup is changed, the new parameters are printed out and separated from the normal result output by blank lines. Second, the priming or access field is printed with each set of results to identify the trunk currently under test. Third, the actual transmission test results will be formatted as two tests per line with one test beginning in column 1 and the other in column 31. The test is identified followed by the results in decimal notation for both far-to-near and near-to-far. For loss tests, a negative number represents actual loss (normally true) and a positive number represents gain. On the gain slope measurement, the three frequencies are identified as separate tests. The results will be printed in the order the tests are run. The balance test results will be formatted as three tests identified as ERL, SRL, and SRLHI. The numbers will be in the format for noise-type tests (two digits, no decimal point). The noise test results will be printed as one test and identified as near-end and far-end. Also shown is the command sequence that generated this output.

4.03 When a trunk group is specified, a summary report is printed after the group is complete. It includes a count of completed tests, busies, operational failures (reorder or hi and dry), within limits, and out of limits.

4.04 When test limits are specified, individual test results are printed only for out of limit tests.

EXAMPLE:

-3.7 -2.2 15 15-19.7-17.9-19.7-18.2-20.1-18.8 34 34

```
>MODE ROTLTS
>ACCESS 9.19155293906
>TEST LOSS NOISE MEAS
>PREP 600 0 105
>PRIME 0501511611111959105l
>FIELD SXS5
>GROUP 10
>TIME 07/01/83,09.00.00
>START 07/01/83,09:01:00
>GO

MODE    ROTL TEST SET
PREP   600  0  105
TEST    LOSS    NOISE                   MEAS
ACCESS  9.19155293906                   TT
PRIME   05015110111119591051            MF
PRIMING FAILED                  BUSY

PRIME   05016100111119591051            MF
LOSS       -3.7 -2.2            NOISE       15   15

PRIME   05016110111119591051            MF
LOSS       -3.7 -2.2            NOISE       15   15

PRIME   05017100111119591051            MF
LOSS       -3.7 -2.1            NOISE       15   15

PRIME   05017110111119591051            MF
LOSS       -3.7 -2.1            NOISE       15   15

PRIME   05018100111119591051            MF
LOSS       -3.7 -2.1            NOISE       15   15

PRIME   05018110111119591051            MF
LOSS       -3.8 -2.2            NOISE       15   15

PRIME   05019100111119591051            MF
LOSS       -3.8 -2.1            NOISE       15   15

PRIME   05019110111119591051            MF
LOSS       -3.0 -2.5            NOISE       18   15

PRIME   05010130111119591051            MF
PRIMING FAILED                  BUSY
TRIES 10  O-O-L 00  OPBAD 02  GOOD  08
>HANGUP
>
```

Fig. 3-1 HUMAN INTERFACE

COMMANDS

```
MODE ROTLTS
ACCESS 9.19155293906
TEST LOSS NOISE G/S NTONE MEAS
PRIME 0501511011111959105l
FIELD SXS5
GROUP 10
GO
HANGUP
d
```

RESULTS

```
  PRIMING FAILED                          BUSY
 -3.7 -2.2    15   15-19.7-17.9-19.7-18.2-20.1-18.8   34   34
 -3.7 -2.2    15   15-19.6-17.8-19.7-18.1-20.1-18.8   34   34
 -3.7 -2.1    15   15-19.7-17.7-19.7-18.1-20.1-18.7   34   34
 -3.8 -2.1    15   15-19.7-17.7-19.7-18.0-20.2-18.5   34   34
 -3.8 -2.1    15   15-19.7-17.8-19.7-18.1-20.2-18.6   34   34
CUT THROUGH FAILED                      TIMEOUT
 -3.9 -2.1    15   15-19.8-17.8-19.8-18.1-20.1-18.4   34   34
 -3.8 -2.6    17   15-18.9-18.2-18.9-18.5-19.2-18.8   34   34
PRIMING FAILED                          BUSY
TRIES 10  O-O-L 00  OPBAD 03  GOOD  07
```

Fig. 3-2 COMPUTER INTERFACE

COMMANDS

```
ECHO
MODE ROTLTS
ACCESS 9.19155293906
TEST LOSS NOISE G/S NTONE MEAS
LIMITS LOSS -04.0:-03.0/-03.0:-02.0
LIMITS NOISE 15:18
LIMITS NTONE 34:34
LIMITS L04 -21.0:-18.0/-20.0:-17.0
LIMITS L10 -20.0:-19.0/-19.0:-18.0
LIMITS L28 -21.0:-18.0/-20.0:-17.0
PRIME 05015110111119591051
FIELD SXS5
GROUP 10
GO
HANGUP
d
```

RESULTS

```
MODE     ROTL TEST SET
TEST     LOSS     NOISE   GN/SLP  N/TONE  MEAS
LIMITS   LOSS  F-N -04.0-03.0  N-F -03.0-02.0
LIMITS   NOISE F-N +15.0+18.0  N-F +15.0+18.0
LIMITS   NTONE F-N +34.0+34.0  N-F +34.0+34.0
LIMITS   L04   F-N -21.0-18.0  N-F -20.0-17.0
LIMITS   L10   F-N -20.0-19.0  N-F -19.0-18.0
LIMITS   L28   F-N -21.0-18.0  N-F -20.0-17.0
ACCESS   9.19155293906                    TT
PRIME    05015110111119591051             HF
PRIMING FAILED                 TIMEOUT

NOISE       MAX  ERR
PRIME    05017110111119591051             HF

L10        -18.9-18.6
PRIME    05019110111119591051             HF

PRIMING FAILED.                BUSY
PRIME    05010130111119591051             HF

TRIES 10  O-O-L 02  OPBAD 02  GOOD  06
```

Fig. 3-3 PLAYBACK MEMORY INTERFACE

5. Errors

5.01 The following errors are detected by the RTS and reported to the communications link. The action taken and information reported are listed below.

ERROR REPORTED	ACTION
1. INVALID command followed by command string.	Command ignored, next command read.
2. ACCESS FAILED followed by NO DIAL TONE, NO WINK, NO ANSWER, REORDER, BUSY, PARKED, or TIMEOUT.	In ROTL test mode, GO commands skipped until new access number found. Otherwise, next command executed.
3. ACCESS PAUSE FAILED followed by same as above.	Same as above.
4. PRIMING ERROR followed by same as above.	Next command read.
5. CUT THROUGH FAILURE followed by same as above.	Next command read.
6. SUPERVISION HIT	Reported after test results: results suspect. Next command read.
7. FSK ERRORS	Same as above.
8. RECYCLE FAILURE	Access line hung up. ROTL access retried at next GO command.

SERVICE, REPAIR, RENTAL AND WARRANTY POLICIES

1. INTRODUCTION

1.01 This section describes the APC Industries, Inc. (hereinafter may also be referred to as the Seller) service, repair, rental, and warranty policies. It is intended for use as a procedural reference in the event the need for service or repair should arise, and also outlines rental policy and limited warranty specifics.

2. RETURNS

2.01 All items returned to the Seller must be accompanied by a Material Return Authorization (MRA) number, which may be obtained by contacting the APC Industries, Inc. Repair Department in Austin, Texas.

512/258-1651 or
800/531-5308 (outside Texas)
TWX 910/874-2020

2.02 After receiving the MRA number, the equipment should be shipped prepaid to:

APC Industries, Inc. 3M
Attn: Repair Department
11705 Research Boulevard
Austin, Texas 78759

Note: Both shipping carton and packing list must reference the MRA number.

2.03 Enclosed with the equipment should be a statement giving the reason for return as well as the name, address, and telephone number of the person to whom the unit is to be returned and billed.

2.04 Service work on APC Industries, Inc. products normally requires less than 48 hours from receipt until the item is reshipped.

2.05 If the equipment received is unserviceable, you will be given the option of replacing it at list price less 15%. The Seller will assume freight costs to return the repaired equipment only if the defective unit is in warranty.

3. EQUIPMENT FOR LOAN

3.01 The Seller maintains a limited stock of equipment for loan which can be air-freighted to you while your equipment is being repaired. This equipment, subject to availability, will be invoiced to the buyer at list price plus transportation charges.

3.02 If loaned equipment is returned to the Seller within ten (10) days after receipt of repaired equipment, full credit will be issued less transportation charges.

3.03 If loaned equipment is not returned to the Seller within ten (10) days after receipt of repaired equipment, the invoice will be due in full.

4. REPAIRS

4.01 WARRANTY ON REPAIRED EQUIPMENT: All repair of test and measurement instruments, except the Model 1301 and 1303, is warranted to be free from defects in material and workmanship for a period of ninety (90) days, commencing on the date of shipment to the buyer. Models 1301, 1303, and all other APC product repairs are warranted for thirty (30) days. The Seller's sole and exclusive obligations and

liabilities under these warranties are and shall be limited to issuance of credit for or repair or replacement of any goods or parts which are proven to be other than as warranted; and the Seller shall have sole discretion as to which of these remedies it shall provide. The Seller shall not reimburse or make any allowance to buyer for labor or freight charges incurred.

4.02 ON-SITE REPAIR: On-site repair service is available for the Model 1301 only. Contact the Seller for specific charges.

5. RENTAL POLICY

5.01 Most APC Industries, Inc. products are available for rent at 12% of the purchase price (minimum of three months), and 75% of the rental payments may be applied toward purchase.

6. IMPORTANT PURCHASER NOTICE

6.01 All statements, technical information and recommendations contained herein are based on information believed to be reliable, but the accuracy or completeness thereof is not guaranteed. Before utilizing the equipment, the user should determine the suitability of the product for his intended use, and he assumes all risks and liability whatsoever in connection with that use.

6.02 All statements or recommendations not contained herein shall have no force or effect unless in an agreement signed by officers of the seller and manufacturer, and the limited warranty is made in lieu of all warranties, express or implied.

7. LIMITED WARRANTY

7.01 The Seller warrants its products to be free from defects in materials and workmanship, subject to the following terms and provisions:

(a) All test and measurement instruments, except Models 1301 and 1303, are warranted for twelve (12) months after date of shipment from the Seller to the ORIGINAL PURCHASER. Models 1301 and 1303 are warranted for ninety (90) days on labor and twelve (12) months on parts after date of shipment from APC to the ORIGINAL PURCHASER. All other APC Industries, Inc. products are warranted for ninety (90) days after date of shipment from the Seller to the ORIGINAL PURCHASER.

(b) The Seller's obligations under this warranty are limited to repairing, replacing, or adjusting at our option any APC Industries, Inc. product which, after normal and proper usage, proves to be defective upon the Seller's inspection, provided that the purchaser shall have reasonably inspected products when received and notified the Seller of any apparent defects within fifteen (15) days of receipt of shipment. **THE SELLER SHALL NOT BE LIABLE FOR ANY INJURY OR FOR ANY MANUFACTURING COSTS OF THE BUYER, OR ANY OTHER SPECIAL OR CONSEQUENTIAL DAMAGES SUSTAINED OR EXPENSES INCURRED BY THE BUYER BY REASON OF THE USE OF ANY DEFECTIVE APC INDUSTRIES, INC. PRODUCT.**

(c) Equipment delivered by the Seller shall not be considered defective if it satisfactorily fulfills the order or complies with published specifications on standard catalog items. This warranty does not extend to any APC Industries, Inc. product which has been subjected to misuse, neglect, accident, or improper applications, nor shall it extend to units which have been repaired or substantially altered out-

side the Seller's factory, nor to any associated instruments, equipment, or apparatus.

(d) Products requiring repair may be returned to the Seller only after obtaining a Material Return Authorization (MRA) number. To obtain an MRA number, contact the Seller's Repair Department in Austin, Texas. After receipt of the MRA number, equipment requiring repair or replacement should be shipped prepaid to the factory accompanied by a written statement setting forth the MRA number, the defects, and the conditions under which the defects occurred. The MRA number should be clearly marked on the shipping carton and on the packing list.

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MANUAL IMPROVEMENT FORM

MANUAL TITLE _____

CORRECTION RECOMMENDED _____

_____

_____

_____

Name _____

Position _____

Company _____

Address _____

City _____ State _____ Zip _____

Telephone _____

MANUAL IMPROVEMENT FORM

MANUAL TITLE _____

CORRECTION RECOMMENDED _____

_____

_____

_____

Name _____

Position _____

Company _____

Address _____

City _____ State _____ Zip _____

Telephone _____

MANUAL IMPROVEMENT FORM

MANUAL TITLE _____

CORRECTION RECOMMENDED _____

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